Editorial

THE other day I was browsing through some old copies of "Wireless Weekly", the forerunner of the present "Radio and Hobbies". In one issue, dated 11th May, 1928, readers were advised in the leading article to treat with reserve overseas reports about television experiments.

There was mention of a £1000 challenge by "Popular Wireless" to J. L. Baird to demonstrate his proposed system in public—a challenge that he apparently did not take up.

The opinion of a Dr. Roberts was quoted, a co-worker with Thompson and Rutherford. Roberts pointed out the need for "some totally new principle" and went on to say "If anyone can reproduce by television, moving pictures even remotely comparable with those shown by the present day cinema, they will have accomplished something which is entirely beyond my humble expectation."

As one looks over the ideas and circuits of the day—trickle chargers, B-eliminators, all-triode receivers—it is staggering to realise that, within less than the ten years mentioned by Dr. Roberts, people in London were enjoying a television service, presented on cathode-ray screens and transmitted to their homes by VHF.

Nor is it any less staggering to realise that almost twenty years have passed since then, with local television plans still in Government pigeon-holes. There have been good reasons for this, of course, but I think the reasons have just about run out.

During the next few months, Federal circles will be fully occupied with elections and urgent financial legislation. But after that, what?

Whichever party is returned to power, I doubt whether they can afford to sidestep much longer the issue of television —who will run it, who for and by what system?

The Royal visit, with its spectacular pageantry, caused many to wish they could "look in" on events and those same people seem to have money now to spend on luxury lines. There's every chance that a Government move to block or delay television would provide irresistible material for an opposition campaign.

Unless the natural train of events is upset by some new world situation, the Federal Government will simply have to throw aside its natural caution, face up to arguments about control, consider its technical reports and make up its mind—for better or worse!

John Moyle

INDEX

Atom Scientists Get New Arm .. 3
We Cannot Ignore Color TV 4
Rocket Tests For Wing Shapes .. 9
New Cars Won't Dent Or Rust .. 11
Hears Whistle, Draws A Curve .. 13
New Research With 'Hot' Atoms .. 14
Technical Review 19
News And Views 25
Build Your Own G-M Counter .. 28
Here's Your Answer, Tom! 40
Small Transistor Receivers 42
Metallised Paper Capacitors 46
You Can Build This Receiver 56
From The Serviceman Who Tells .. 65
A New Electronic Flash Unit 70
RF Supplies For G-M Counters .. 81
A Reader Built It! 83
Let's Buy An Argument! 84
Trade Reviews And Releases 91
Off The Record 94
Record News From Overseas 97
Short-Wave Notes 98
The Ham Bands 99
An Ornamental Garden Gate .. 107
Answers To Correspondents 111

RADIC

AND HOBBIES IN AUSTRA

A NATIONAL MAGAZIN
OF RADIO, HOBBIES AN
POPULAR SCIENCE

EDITOR
JOHN MOYLE
S.M.I.R.E. (Aust.)

TECHNICAL EDITOR
NEVILLE WILLIAMS
M.I.R.E. (Aust.)

TECHNICAL STAFF
RAYMOND HOWE
MAURICE FINDLAY
PHILIP WATSON
MERVYN HUDDLESTON

Vol. 16 No. 1

SUBSCRIPTION RATES
C'wealth, NZ, N. Guinea, Fiji—18/- pa
United Kingdom—£1/-/6 pa
B. Empire—£1/3/- pa
Foreign—£1/5/- pa

Published on the first Friday of each month by Associated Newspapers Ltd., 60-70 Elizabeth St., Sydney.

Phone BO333

OUR COVER PICTURE

Scaled-down wings attached to small supersonic rockets, are being used by Lockheed to discover the merits of various wing shapes. Camera equipment in the nose records the wings' behavior for subsequent examination. See full story on page 9

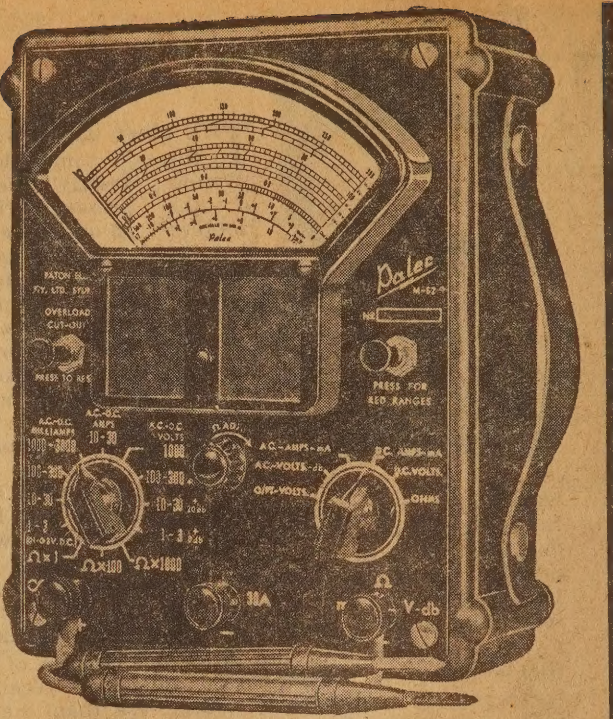
NOW!

MULTIMETER WITH 52 RANGES

THE PALEC MODEL *M52*

with complete

TOMATIC OVERLOAD PROTECTION!



● MODEL M.52

MULTI RANGES. 52 self-contained ranges—no ext. batteries or power supplies needed.

PERFECT RANGE STEPS. Utilises multiples of 3 and 10 thus ensuring a maximum ratio of no more than 3.3:1 between volt or current range steps.

FULL COVERAGE. Widest scope of volt and current ranges Volts 1 to 1000, A.C. and D.C. Current 1 mA. to 30 Amps. A.C. and D.C.

OVERLOAD PROTECTION. A fully protective circuit breaker has been developed which operates against excessive overloads, forward and reverse, A.C. and D.C.

OTHER FEATURES. Semi hard unbreakable rubber case and test prods: 6 inch Sector type meter totally enclosed and detachable: Complies with B.S.S. No. 89 covering first grade instruments: 1000 O.P.V. on all volt ranges: Last but not least, this instrument has behind it **Australian factory service.**

Ranges

Volts D.C. 0/0.1-0.3-1-3-10-30-100-300-1000	9
Volts A.C. 0/1-3-10-30-100-300-1000	7
Output (with series cond.) 0/1-3-10-30-100-300-1000	7
Current D.C. mA.'s 0/1-3-10-30-100-300-1000-3000 Amps 10-30	10
Current A.C. mA.'s 0/1-3-10-30-100-300-1000-3000 Amps 10-30	10
Ohms (int. Bat.) 0-3000: 0-300,000: 0-3 megohms	3
Decibels Ref. level 1 mW. in 600 ohms	3
„ Ref. level 6 mW. in 600 ohms	3
Total	52

Polished wooden Portable case available extra. Price on application.

ORDER NOW FOR EARLY DELIVERY.

OTHER PRODUCTS:

Switchboard and Panel Instruments, including Ammeters, Voltmeters, Wattmeters, Power Factor Indicators, Frequency Meters, Pyrometers, Exposure Meters, Electronic Photoflash, Oven Heat Indicators, etc.

Palec

MODEL M.32 (formerly Model M.30/2)

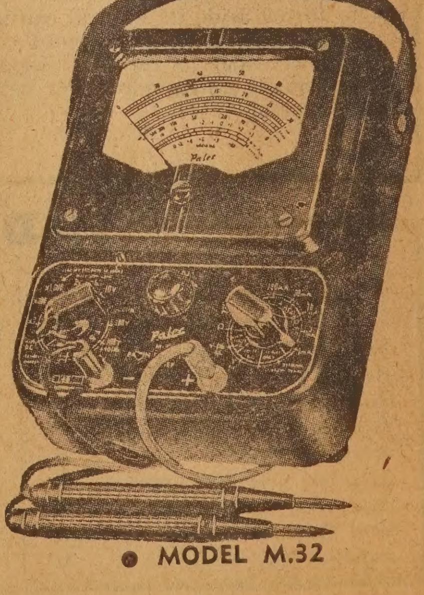
MULTIMETER

Model M.32, 32 range multimeter is indispensable for modern radio and electrical installation and service.

Ranges

Volts D.C. 0/0.1-3-10-30-100-300-1000	7
Volts A.C. 0/3-10-30-100-300-1000	6
Current D.C. 0/1-3-10-30-100-300 mA.-1-3-10 amp.	9
Current A.C. 0/1 mA. (for use with ext. current transformers)	1
Ohms 0/1000: 0/10000: 0/1 megohms	3
Decibels Ref. level 1 mW. in 600 ohms	3
„ Ref. level 6 mW. in 600 ohms	3
Total	32

Other features: Meter scale, 4in, all measurements from two terminals only, bakelite housing, test leads supplied. Accurate, reliable, keenly priced.



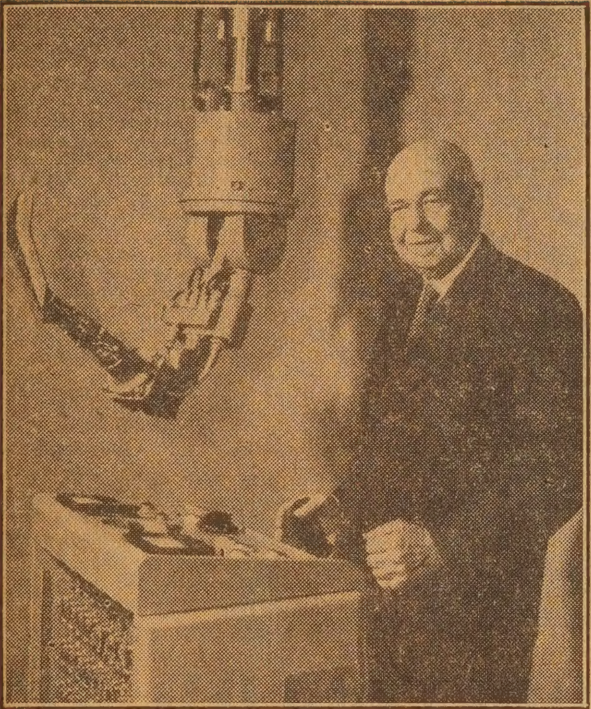
● MODEL M.32

PATON ELECTRICAL

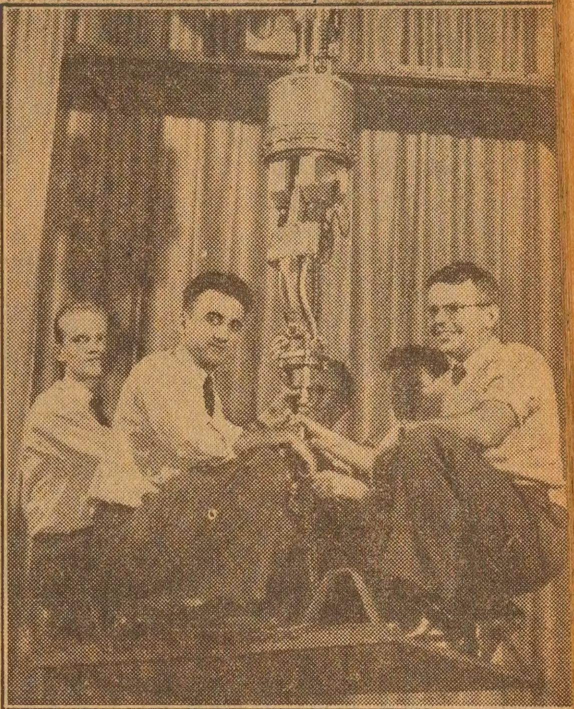
PTY. LTD.

Manufacturers of all Types of Radio & Electrical Test Equipment & Meters
90-94 VICTORIA ST., ASHFIELD, SYDNEY. UA 5266. TELEGRAMS: "PALEC"

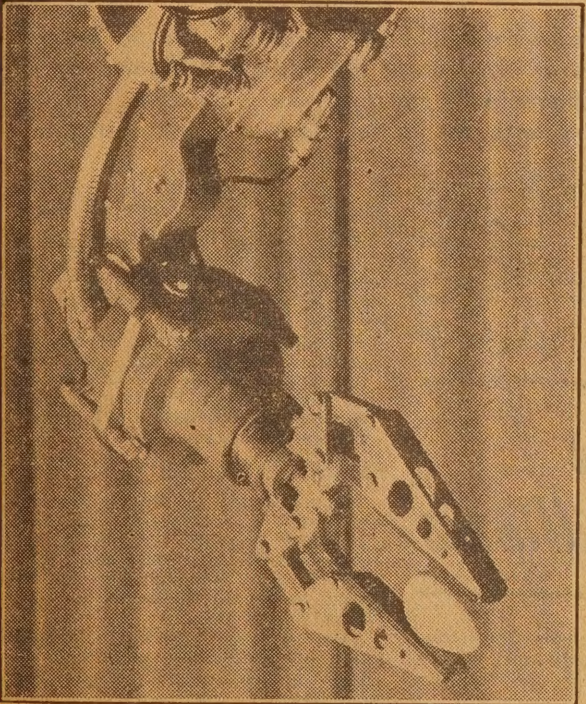
ATOM SCIENTISTS GET NEW ARM



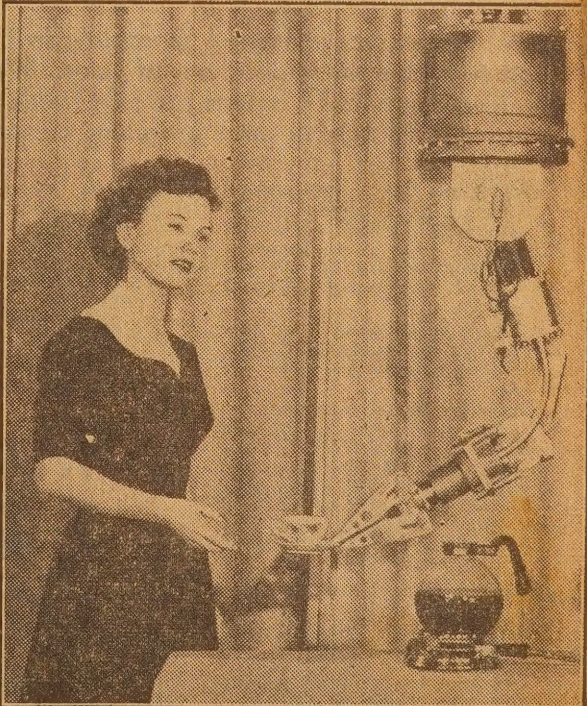
One of the most efficient robot arms yet devised has been produced by engineers of the American General Mills Co. J. F. Bell, founder of the company shows how the hand can be manipulated from a console normally outside the danger area.



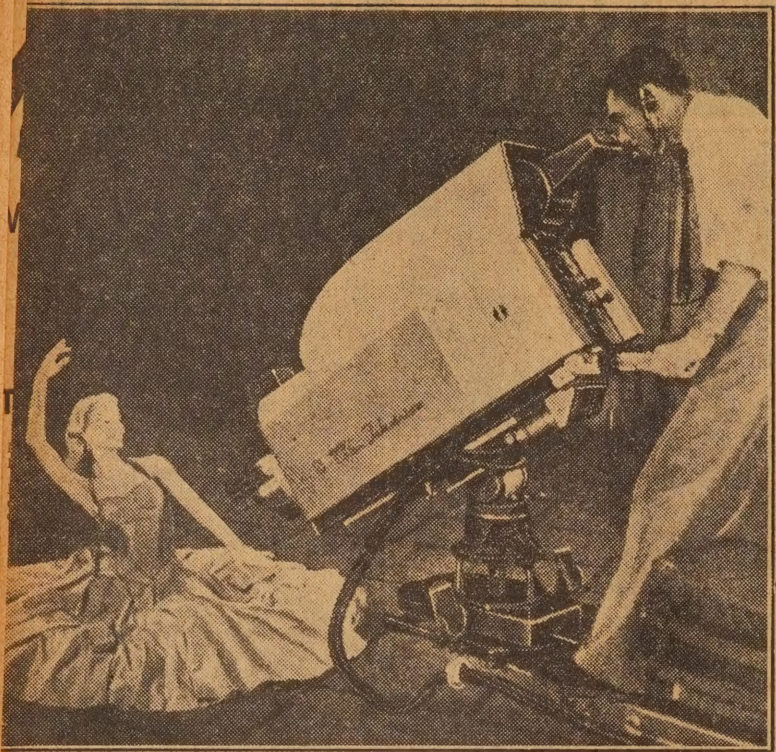
When hanging vertically, the arm can support half a ton, o more than the combined weights of the five men shown here Under less favorable conditions, with portions of the arm horizontal, the "hand" can manage between 40 and 75 pounds.



From handling heavy weights, the hand turns to the gentle task of picking up an egg. It will manipulate a screwdriver better than any human because the arm position can be preset accurately and the hand made to rotate continuously.



It's quite easy for the remote operator to pour and deliver a cup of coffee. Well over a dozen different "hands" have been devised for attachment to the arm. Television would enable the operator and robot hand to be miles apart.



Color television cameras currently in use are larger than conventional types but are used with specially designed dollys. They are all-electronic in operation and their pictures can be viewed either in color or black and white, if no color receiver is available.

WE CANNOT IGNORE COLOR TV

Events overseas have moved so rapidly in the television field that Australia can no longer afford to ignore the implications of color. Whatever other steps the Federal Parliament may take in setting up a TV service it should frame supplementary standards for stations to radiate and viewers to receive color programs compatible with the initial black and white service.

by Neville Williams

USTRALIA has the unique opportunity to set up a television sys- n on international high definition ndards, with color as an immedi- and optional feature. It's an op- rtunity which we cannot afford to ss up lightly.

But we may easily pass it up un- s the matter is investigated now the light of current overseas de- lopments.

Chief among these developments e (1) the successful mating of ansmission standards for mono- rome and color; (2) the presenta- on of highly successful color pro- ams and (3) the rapid advance in levision tape recording, with its romised reduction in programming sts.

PIPE DREAM

A few short years ago, the very lea of a color television service was egarded, even in the US, as an am- itious but impractical pipe dream. et-builders and radio stations had roblems enough with monochrome V, without waking up the subject f a color service.

They were quite prepared to relegate the whole question to some remote future date.

That authorities elsewhere should think the same way is natural enough, particularly in countries like Australia, where a television system still has to be inaugurated with all its attendant problems. . . "Let's get ordinary black-and-white TV going first. After that we can worry about color."

But "after that" may be too late or it might present standardisation problems we can deal with more easily now before any public money is invested in television.

At the very least, the proposed standards should be re-examined and amplified, so that the way is open for compatible color transmissions to be presented, by anyone able to do so, as part and parcel of their normal service.

How rapidly the facility is taken up by the stations, or color receivers are bought by the public would be governed by public demand, by economic factors and by technical progress. The position would resolve itself naturally without becoming a political and industrial football, as it has been for so long in the US.

The vital point about color television is that the transmissions can now be made fully compatible—or interchangeable — with accepted black-and-white transmissions.

A station can transmit portion of its program material in black-and-white, then immediately switch over to full color for a following session. Once the transmitter has been adapted for color, no further changes have to be made.

At the receiving end, a viewer with a monochrome receiver need not be aware of any difference. The pictures on his screen look much the same, whether the station is transmitting in monochrome or in "polychrome", as the Americans call it.

The next-door neighbor, who can, perchance, afford a more expensive set, will see the programs exactly as they are transmitted, in black-and-white or in color, without getting out of his chair.

Thus, as far as the viewers are concerned, the choice of receiver—whether a large or a small screen, monochrome or color—is purely a personal matter.

What is important, of course, is that much of the program material available to television is in color already—outdoor events, on-the-spot telecasts, small studio set-ups and many films.

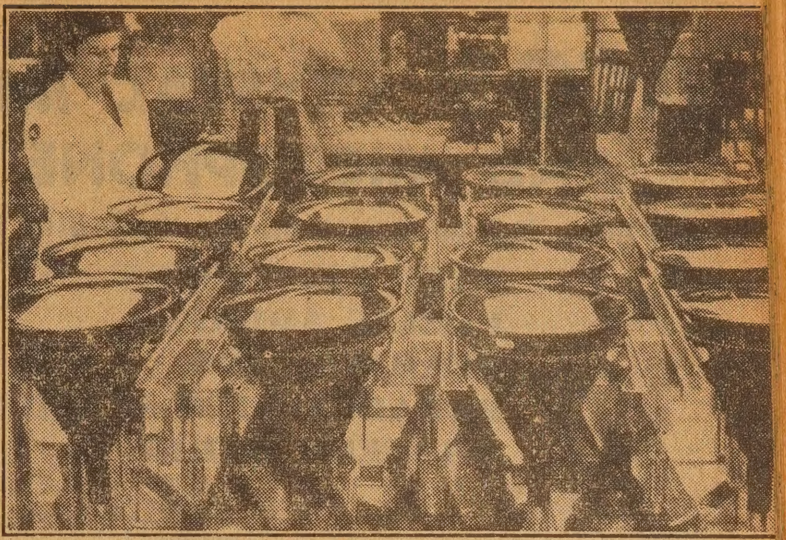
NORMAL TRANSMITTER

Once the initial outlay has been made on the necessary equipment, this color content can be radiated just as readily as monochrome and a proportion of the viewing audience stands to benefit by it, without prejudice to the rest.

Even a few years ago, it would have been impossible to plan a television service on this "please yourself" basis.

Originally, it seemed that the constituent colors could be separated and re-combined only by the use of scanning wheels and separate video channels.

The Columbia Broadcasting System was so convinced by the inevit-



RCA has made design data for color kinescopes available to its rival tube manu facturers throughout the US. Despite problems, the industry is confident tha it can produce these or similar tubes at a reasonable figure. The sixteen kinescope shown above are part of a pilot run at the RCA Pennsylvania factory.

ability of this approach — and by the future of color TV — that it managed to secure approval by the FCC for a color service on these semi-mechanical lines.

It ran demonstration programs and tried to organise production of special receivers to bring color into US homes.

But the radio industry, led principally by RCA, jacked up on this reversion to the days of Baird.

They demonstrated primitive but workable equipment which indicated that all-electronic color was, in fact, possible.

What was more important, they showed that the color "information" could be sliced up and fitted into the same scanning routine as already used for 525-line monochrome pictures.

WAIT A WHILE!

If the FCC would only be patient, they maintained, their backroom boys would come up with equipment which would produce high-definition full-color pictures, completely compatible with existing black-and-white standards.

The changeover to color could then proceed on a gradual and orderly basis with no receivers or equipment suddenly out of date, no urgent necessity to buy new sets and no lack of at least a monochrome audience for the initial colorcasts.

The FCC took a lot of convincing, and it is only now, after much urgent research and lengthy court proceedings, that the position appears to be straightening itself out.

A national trade committee, the NTSC, has picked the eyes out of the RCA compatible system, swung in schemes from other sources, and gained the support of the entire radio industry in the US.

Even the Columbia Broadcasting System stopped playing with color wheels and came out in full support of the compatible system.

The problem now has largely reverted to individual factories where manufacturers have to find ways and means of mass-producing color receivers cheaply enough to attract buyers.

PROBLEMS TO OVERCOME

While tube manufacturers have hand-made quite a lot of color kinescopes, they yet have to learn to mass-produce them and maintain incredibly fine tolerance figures in the assembly of the screen structure.

They say they can do it, and at an ultimate price which will enable color receivers to sell competitively with the monochrome variety.

However, more critical circuits, more valves and more components are necessary to sort out the color signals and this can only mean a very substantial margin between the price of color and existing monochrome receivers. The first sets look like selling for anything between 800 and 1500 dollars, using what the Americans now describe as a "squint-sized" 15-inch screen.

Viewing the situation as it is at present, US experts see no sudden or dramatic swing-over to color and certainly no panic about obsolete equipment. The solving of the compatibility problem has seen to that.

TV stations, they say, will gradually introduce color programs into their regular schedules and, given this inducement, viewers will begin to buy color receivers to their liking.

But they foresee, too, that there will be competition for the extra dollars. Some new set buyers will inevitably prefer larger black-and-white pictures to the smaller screens which the first color receivers will probably have to use.

At least, the whole process will be orderly and subject to normal competition and buyer trends. And there seems to be no good reason why the Australian service should not begin at this very point.

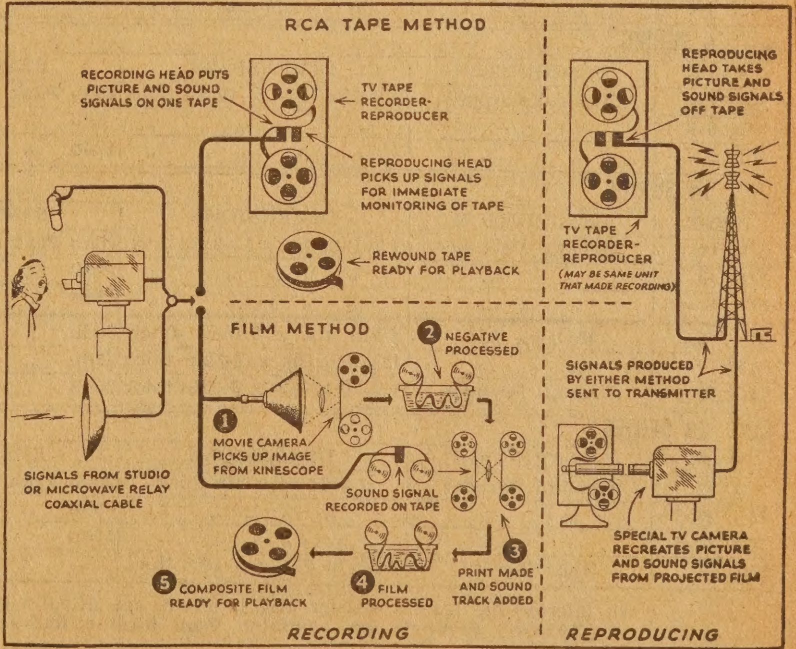
But back of the mere color question looms another major development — the successful application of tape recording to picture programs.

Moguls of the entertainment world are now only just beginning to realise how deeply its ramifications will go. It may vitally influence the whole economics of television from the pi gram and production angle.

It may easily spell the differer between color and no color, as far Australia is concerned, because fi facilities here. particularly color fil are extremely limited.

But to start at the beginning, till a few years ago, all but a fe visionaries believed that the phot graphic film was the only feasib way of reproducing motion picture Vast sums have been poured into t development overseas of optic equipment, photographic processe film stock and synchronised sound r cording.

Television stations might run the studio programs and their on-the-sp cover but, for all recorded materia they had to borrow the equipment, th

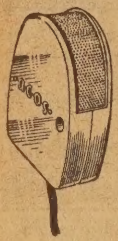

RCA TAPE METHOD
RECORDING HEAD PUTS PICTURE AND SOUND SIGNALS ON ONE TAPE
TV TAPE RECORDER-REPRODUCER
REPRODUCING HEAD PICKS UP SIGNALS FOR IMMEDIATE MONITORING OF TAPE
REWOUND TAPE READY FOR PLAYBACK
REPRODUCING HEAD TAKES PICTURE AND SOUND SIGNALS OFF TAPE
TV TAPE RECORDER-REPRODUCER (MAY BE SAME UNIT THAT MADE RECORDING)
FILM METHOD
1 MOVIE CAMERA PICKS UP IMAGE FROM KINESCOPE
2 NEGATIVE PROCESSED
SIGNALS FROM STUDIO OR MICROWAVE RELAY COAXIAL CABLE
SOUND SIGNAL RECORDED ON TAPE
3 PRINT MADE AND SOUND TRACK ADDED
4 FILM PROCESSED
5 COMPOSITE FILM READY FOR PLAYBACK
SIGNALS PRODUCED BY EITHER METHOD SENT TO TRANSMITTER
SPECIAL TV CAMERA RECREATES PICTURE AND SOUND SIGNALS FROM PROJECTED FILM
RECORDING
REPRODUCING

Here shown in diagrammatic form is a comparison of the steps required in recording and reproducing a TV programme by the use of conventional TV filming and by RCA's video tape. The latter process, which is feasible for both monochrome and color, may slash programme and distribution costs by more than 90 pc.

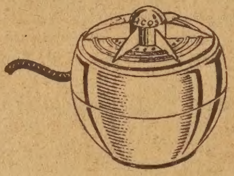
"ACOS" CRYSTAL MICROPHONES AND MICROPHONE INSERTS

The Finest Range Available in Australia for:—

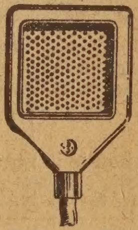
TAPE RECORDERS
PUBLIC ADDRESS
HEARING AIDS
BROADCASTING STATIONS
AMATEUR RADIO



MODEL 35
(HAND/DESK)
PRICE £2/15/-

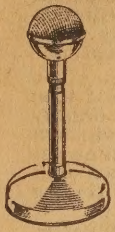


MODEL 33
(DESK)
PRICE £6/18/6

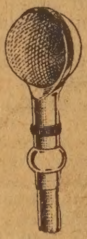


Front view Only

MODEL 28
(LAPEL)
PRICE £5/19/6



MODEL 22
(HAND/DESK)
PRICE £9/18/6



MODEL 16
(HAND/FLOOR)
PRICE £26/19/6

TECHNICAL DATA SHEETS GLADLY FORWARDED ON REQUEST

"ACOS" CRYSTAL MICROPHONE INSERTS

MIC. 3 SERIES

TYPE	DESCRIPTION	DIMENSIONS	RESPONSE	CODE	PRICE
MIC.3-2	General Purpose	1¾in dia. x ⅜in thick	20db Peak at 2500 C.P.S.	Mona	£1 19 3
MIC.3-5	,, ,,	,, ,, ,, ,, ,,	12db ,, ,, ,, ,,	Mervyn	1 19 3
MIC.3-6	,, ,,	,, ,, ,, ,, ,,	5db ,, ,, ,, ,,	Myrtle	1 19 3

MIC. 6 SERIES

TYPE	DESCRIPTION	DIMENSIONS	RESPONSE	CODE	PRICE
MIC.6-4	General Purpose	2 1-32in dia. x 19-32 thick	20db Peak at 2250 C.P.S.	Margie	£1 19 3
MIC.6-6	,, ,,	,, ,, ,, ,, ,,	5db ,, ,, ,, ,,	Maudie	1 19 3
MIC.6-11	,, ,,	,, ,, ,, ,, ,,	12db ,, ,, ,, ,,	Mandy	1 19 3

MIC. 14 SERIES

TYPE	DESCRIPTION	DIMENSIONS	RESPONSE	CODE	PRICE
MIC.14-5	General Purpose	1 7-16in dia. x 11-32in thick	20db Peak at 3500 C.P.S.	Maxie	£1 19 6
MIC.14-11	,, ,,	,, ,, ,, ,, ,,	12db ,, ,, ,, ,,	Mitchell	1 19 6
MIC.14-12	,, ,,	,, ,, ,, ,, ,,	5db ,, ,, ,, ,,	Malcolm	1 19 6
MIC.15	Hearing Aid	0.9in dia. x 0.155in thick	30db ,, ,, 3000 ,,	Marlene	1 19 6
MIC.17	,, ,,	15-16 in sq. x 7-32in thick	30db ,, ,, 3500 ,,	Maggie	1 19 6
MIC.18	General Purpose	1 7-16 in dia. x 9-32in thick	20db ,, ,, ,, ,,	Maisie	1 19 6

MIC. 23 SERIES

TYPE	DESCRIPTION	DIMENSIONS	RESPONSE	CODE	PRICE
MIC.23	General Purpose	1 3-16 sq. x ¼in thick	20db Peak at 3000 C.P.S.	Maureen	£1 19 3
MIC.23-3	,, ,,	,, ,, ,, ,, ,,	5db ,, ,, ,, ,,	Margaret	1 19 3
MIC.23-4	,, ,,	,, ,, ,, ,, ,,	12db ,, ,, ,, ,,	Milton	1 19 3
MIC.32	High Quality	1 13-16 dia. x 9-16in thick		Martin	2 15 6

All Microphone Inserts, except MIC.15-17-18, are fitted with inbuilt 10 meg. Resistor.
"ACOS" Products are available from leading Radio Houses everywhere.

EXCLUSIVE AUSTRALIAN AGENTS **AMPLION (Australasia) PTY, LTD,** **CABLES and TELEGRAMS AMPLION — SYDNEY**

techniques, the patents and the facilities of the film world.

However, the boot might easily end up by being on the other foot. Or, to change the metaphor, the television tail is beginning to wag the dog.

Theatre interests have long been more than just perturbed by the impact of television on their night-time audiences. The film-world's experiments with 3D, wide screens and dispersed sound are simply part of their attempt to maintain a "spectacle" advantage over what television can do in the home.

THE "STATUS QUO"

Everything has been aimed at keeping their theatres in business and maintaining the industry on a firm footing.

But, despite all the placards and the ballyhoo, a revolution has been going on behind the scenes. While the theatres have been boasting about their bigger screens and better sound, Hollywood cameras have, of necessity, been grinding out more and more films for television release only.

So strongly is the tide flowing that what was once a minor activity has become the major one. Hollywood interests are now turning out more films for television circuits than they are for their own theatre chains.

The proportion in footage is about 5ft of "telefilm" for every three for regular theatre release. At a recent survey there were 40 features in the making for TV against a mere 16 for the theatres!

Unless the curve rolls off unexpectedly, television might end up by absorbing 95 pc of Hollywood's output.

This is a revolution which, although confined at present to the US, will inevitably be repeated elsewhere. Film interests probably don't like it but at least they and their elaborate film laboratories are managing to stay in business.

Into this rather turbulent scene has suddenly burst the threat of magnetic tape—or the promise, depending on which side you happen to be on. Can it be used to record sight as well as sound?

Its advantages for recording sound has never seriously been contested and motion picture companies along with everyone else in the radio and recording business, have been using it quite freely. Powdered iron might easily displace the optical sound tracks from standard films.

That is one thing, but to record on tape all the complex visual information of a moving picture is quite another.

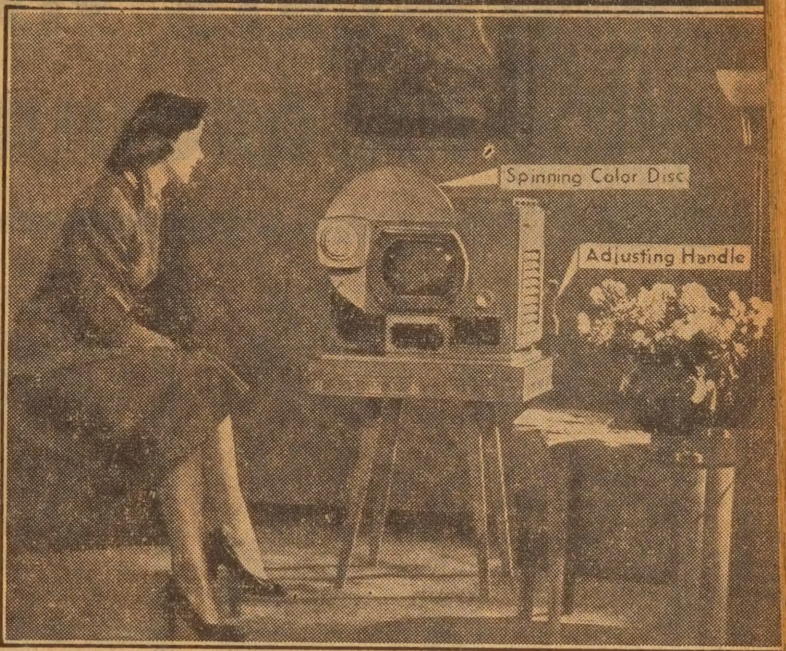
MERE LAB. EXPERIMENT!

Even the announcement from the Bing Crosby Institute that such had been accomplished, did little more than vaguely disturb the picture interests. The tape was too wide and travelled too fast to make it any more than an interesting laboratory experiment.

If television interests wanted to play with things like that, they were presumably welcome to them. Cheap (and nasty) television tapes would do nothing but send the viewers back to the theatres and their wide-screen extravaganzas!

But it has now become abundantly clear that more people were interested in television tapes than just the Bing Crosby Institute. And they were making rather spectacular progress in their aim to eliminate all four steps from the conventional TV-film recording process (see diagram).

REJECTED BY U.S. RADIO TRADE



This is the kind of approach which the US industry rejected wholeheartedly, despit tentative FCC approval. Whirling discs were out, they said, likewise any scheme that would not give compatible color and monochrome pictures.

So it was, in typical style, that RCA's General Sarnoff, who happens also to be chairman of the NBC, recently called together 400 representatives of the US entertainment world and proceeded to demonstrate RCA's accomplishments in visual tape recording.

Only a few weeks previously, Sarnoff had piped compatible color signals clear across the country in a 4000-mile zigzag, and displayed them as bright glowing pictures in the movie capital itself. This, in itself, was disturbing enough.

T.V. SHOW RECORDED

Now, at the Princeton Laboratories, 45 miles from New York, they saw RCA engineers tune in and record on tape the regular NBC television monochrome broadcast, while the audience watched the pictures direct.

A few minutes later the tape was "played back" and the same pictures re-appeared on the screens with no perceptible loss of definition.

RCA's tape was a mere quarter-inch wide and ran at 30 feet per second, with a promise of much lower operating speeds in the immediate future. A single 19-inch reel Sarnoff said, would then carry the sound and a 4 Mc picture channel side-by-side for a 15-minute session.

But what further rocked the audience was that RCA had managed to squeeze onto a half-inch tape enough tracks to carry not just a picture and the sound but signals for each of three primary colors.

And so, as it watched the screens of a group of RCA color kinescopes, the audience saw, for the first time, color pictures with synchronised sound—coming from a strip of brown coated tape!

The color signals were degraded somewhat and not immediately suitable for re-transmission, but RCA regards these as mere incidental problems which will be solved in d course.

The implications of the demonstration were painfully obvious to the fil representatives, who were credite with remarks varying from "miraculous" to "this is the end".

To be sure, the results were no above criticism, but the record of th company, who had done so much t lick the compatibility problem, suggested that the major problem couldn't hold out for long.

In about two years, Sarnoff said, stations would be able to record programs on tape with adequate quality and at a fraction of present film costs. The saving would be 90 pc for monochrome and 95 pc for color!

The equipment might even be made simple enough for home use. Domestic viewers would ultimately "tape" their favorite programs and play them back through their TV set — home movies without a film or projector!

PORTABLE USE

Use of tape with portable TV cameras was another obvious and feasible objective.

Equipped with these visual tape machines, television interests would be much less dependent on films. They could produce, monitor, record and exchange shows with the same facility that sound tapes are now made and exchanged between broadcast stations.

All the costly facilities and the technicolor prints of the film world would, for them, become obsolete.

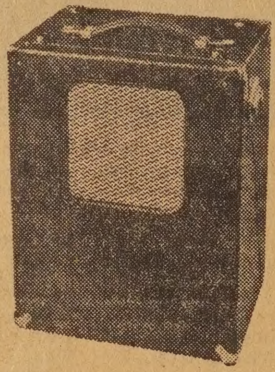
With their ability to monitor the tape as it was made, to retake faulty scenes on the spot, using the same tape over again, to cut, edit, splice and copy, television producers would be able to operate at a fraction of

(Continued on Page 105)

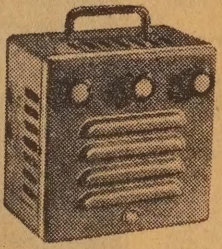
MEETS YOUR P.A. REQUIREMENTS

A.W.A. permanent magnet speakers are available in a range of sizes and types for every P.A. and sound reproduction need.

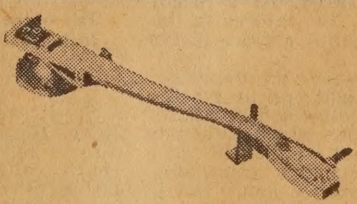
Portable address system model PA90 operates from mains or accumulator.



Pillowspeaker PS50 is a crystal type speaker for hospital or home use.

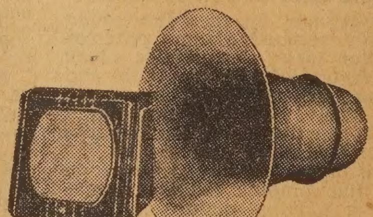


Amplifiers from five watts to seventy watts, for mains or accumulator operation, provide wide audio range reproduction, robust construction and reliable operation. Each model is built to the same high standards of quality workmanship and performance for which A.W.A. has established a world wide reputation in broadcasting and communication equipment.



The A.W.A. Twin Jewel Transcription Pickup, designed to meet the exacting requirements of modern broadcast installation is the ultimate for audio system high fidelity reproduction of modern wide range recordings.

Attractive ivory and walnut housings for wall or table mounting, and flare housings for high efficiency and outdoor requirements are available to suit the various speaker sizes.



A.W.A. Sound Engineers will be pleased to survey your requirements and submit estimates for permanent installations. The Public Address Hiring section is equipped and staffed to meet any temporary need for sound amplification.

PUBLIC ADDRESS SYSTEMS

Manufactured and guaranteed by

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED

47 YORK STREET, SYDNEY. BO233—167 QUEEN STREET, MELBOURNE, MU9161.

AVAILABLE IN OTHER STATES FROM

NEWTON McLAREN LTD., ADELAIDE. NOYES BROS. (MELBOURNE) LTD., HOBART. CHANDLERS PTY. LTD., BRISBANE. NICHOLSONS LTD., PERTH. ALSO FROM LEADING WHOLESALERS.

ROCKET TEST FOR WING SHAPES

At a remote desert base, Lockheed Aircraft engineers have turned the normally destructive combat rockets into supersonic scientific tools to help determine the shape of aeroplane wings to come.

Our Cover Picture—A Lockheed engineer checks over a rocket prior to takeoff. Note camera ports near the nose. Movie films taken in this way have appeared on the newsreels and show some wings bending and twisting violently before breaking right off. Other wings are unaffected by the supersonic speed.

IN a continuing research program to test which wing shapes and structures are best for penetrating the sonic barrier and flying at speeds about twice as fast as sound, Lockheed has attached scale-model wings onto 5in high-velocity rockets which carry cameras and test instruments instead of warheads.

Rockets which hit speeds as high as 1500 mph provide test flights difficult to achieve in any other way.

Results are determined from in-flight movies filmed by cameras packed into the rocket nose and from electronic apparatus which collects and radios test data to recording devices on the ground. Then the collected information is fed into electronic brain machines for detailed analysis of what happened to both the rocket and its wings at various speeds and stresses.

IDEAS PROVEN

The tests, intended to help develop wings for fantastically fast jet fighters of the future, already have substantiated Lockheed's commitment to very thin, straight wing design for fighter planes according to chief engineer C. L. Johnson.

Experiments on 50 different wing models have been conducted in isolated desert test bases over the past nine months. More are scheduled.

The wing models have to stand up under the blast-off speed and high acceleration of rockets — and they have to prove themselves at low altitude where air loading is most severe.

Some types never make it. Certain designs, although built of sturdy metal, fluttered and flapped like a humming bird's wings until finally they broke off.

Johnson pointed out that a very thin wing is needed for efficiency in supersonic flight. But, he said, the thinner the wing, the less stiff it is likely to be. Old-style wings were thick enough that, if they were designed to carry the load, they automatically had sufficient stiffness.

The aeronautical engineer added that Lockheed-designed thin wings met both criteria.

LESS WASTAGE

Although rockets ordinarily are expendable, Lockheed has equipped its supersonic test beds with parachutes which automatically lower the "rocket laboratory" with its valuable instruments safely to earth.

The research rockets were designed to produce aerodynamic loads on the miniature wings which would be equal to or greater than those encountered by a full-sized wing on a supersonic fighter.

Lockheed checked test data in analog computing equipment, sometimes called "electronic brains", to learn not only how and when each phenomenon occurred but also the relationship between such technical points as aspect ratio, flutter and torsional divergence.

Engineers are interested as much in learning which structures fail as in determining which ones succeed, Johnson explained. He added that, with modern equipment, scientists are probing into aerodynamic problems in more detail than has ever before been possible.

"We are convinced that the straight-thin wing can be produced smaller, lighter and cheaper than any other type and yet have complete structural integrity and aeroelastic efficiency," Johnson emphasised.

Special machines for turning ou strong, light, one-piece sections of larger size than ever before are vital part of an array of new equipment in Lockheed's workshops. They are used not only in producing current fighters but Super Constellation transports and advanced military craft.

GIANT BRITISH FREIGHTER PLANE

FIFTEEN hundred gallons of water have been loaded aboard Britain's newest big military freighter as a test load during flight trials, as a preliminary to carrying real loads like guns, lorries, and tanks.

The 1500 gallons were stored in tanks and moved about for tests with the aircraft centre of gravity at different positions.

The plane, the Blackburn Beverley freighter, which has flown carrying such loads as a bus and a giant crane, can operate in and out of short grass landing-strips. The four-engined Beverley is fitted with special wheel brakes and braking propellers so that it can pull up in a few hundred yards. It can manoeuvre and taxi on muddy fields and poor surfaces.

During tests with a full load on board, the Beverley has taken off and climbed with one engine cut, and has also maintained height with two of its Centaurus engines cut.

Following these tests the Beverley has begun heavy dropping trials with the British Army.

The hold of the Beverley, which measures 40ft by 10ft by 10ft, has been fitted with a roller conveyor, running the full length of the floor. The conveyor ends at the big "clam-shell" type rear loading doors, which are removed when aerial supply dropping is in progress. There is, therefore, an unimpeded opening 10ft by 10ft through which loads can be parachuted. The Beverley is designed so that the tail boom is above the fuselage well clear of the unloading opening.

The loads to be dropped—vehicles or guns, for instance—are strapped on the platforms, and are unloaded into the Beverley from lorries also fitted with roller-conveyors, which back up to the rear of the aircraft. The winch fitted to the Beverley hauls them aboard.

EMITAPE

MAGNETIC RECORDING TAPE . . .

sed by the A.B.C.,
he B.B.C. and
roadcasting
rganisations
hroughout
he world

EMITAPE
EMI
TR.2.FP

- EMITAPE is the outcome of 50 years of unequalled experience in the Science of Sound Recording.
- EMITAPE is manufactured by E.M.I. (the Group which produces "H.M.V.," Columbia and Parlophone records).
- Two types of EMITAPE are available, High Coercivity and Low Coercivity, in 600 ft. and 1,200 ft. lengths, wound with the oxide inside or outside on 5″ and 7″ spools. For professional users, 11½″ European Spools (cap. 3,250 ft.) and NAB Spools (cap. 2,400 ft.) are available.
- *Full details of Emitape are available through dealers or direct from the Engineering Sales Dept.*

E.M.I. (Australia) PTY. LIMITED

Engineering Sales Department • 575 Parramatta Road, Leichhardt, N.S.W. Phone LM 1491

INTERSTATE DISTRIBUTORS: Vic. and Tas., E.M.I. (Australia) Pty. Limited., 167 Flinders Lane, Melbourne. **South Australia**, E.M.I. (Australia) Pty. Limited, 265 Rundle St., Adelaide. **Queensland**, A. E. Harrold, 123 Charlotte St., Brisbane. **West Australia**, Wyper Howard Ltd., 671 Hay St., Perth.

NEW CARS WON'T DENT OR RUST

An industrial revolution is brewing in the car factories, a revolution that might bring yo "custom" cars—or less stylised ones—at moderate prices, with rust-proof, dent-proof squeak-proof bodies. If motor makers learn to work with plastics as they have with steel, the face of the whole industry will be changed, and so will the faces of the cars it produces.

BY GEORGE KOETHER

TODAY, to own a custom car, which differs in body design from the mass-produced package, you have to pay a big premium for a special body from the factory — if you can get it! As a compromise, you can "customise" your car by paying someone to alter it in metal, also a costly business.

All that may be changed. The materials to change it are at hand, and the required machinery and methods are being worked out.

The revolution depends upon three developments: (1) Extended use of plastic dies to replace steel dies; (2) perfection of glass-reinforced plastic to replace steel bodies, and (3) "automation" — a technique to move parts into and out of production machines without being touched.

If these developments were incorporated in a bold new program, the motor car industry could be decentralised, with plants building bodies as well as assembling them, and with numerous small body builders offering custom designs to a public becoming more and more "custom car" conscious.

However, from the public's point of view, the plastic body is enticing for more than just its custom quality.

Fibre-glass-reinforced plastic bodies, weight for weight, are more resistant to impact than steel, do not need complicated sub-frames, have greater resiliency, will not corrode, and if chipped or scratched in collisions, can be repaired for a fraction of the cost of bumping out a steel body panel.

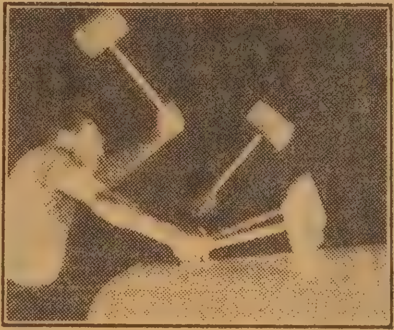
SMALL PARTS

Plastics are not new to the auto industry; they have been used for years in small parts. But when the auto makers studied a technique successfully applied in aircraft manufacture and began to use plastic dies, their eyes popped.

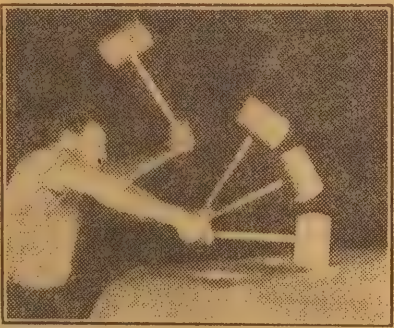
Recently, in the press plant of a "big three" auto maker, a steel fender die went bad. It was Friday afternoon. Over the weekend, a local die shop built a plastic die and, by Tuesday morning, the press was working and 1000 parts had been struck off. (To make a steel die requires from four to six months.)

In another plant, a plastic die, used experimentally on a body panel press, cracked when a steel bar fell between the punch and the die.

Before anyone could put through an order for a new die, a technician from the local die-maker had arrived. Mixing a little powder with liquid, he patched up the die and had the press running in 45 minutes. Since then, more than 100,000 parts have been struck from the same plastic die.



Stroboflash pictures dramatise the force of a hammer blow on the hood of an experimental, plastic-body car at the General Motors Technical Centre.



Hammer has hit the plastic fibre-glass-reinforced hood and actually "dented" the hood with a depression that would have remained in steel.

Plastic hood is so resilient that it snaps back quickly to its original shape, a characteristic which may save the motorists a lot of trouble and expense.

Plastic dies are now accepted the industry, and Chrysler, Ford a General Motors are working fev ishly to beat each other to the ta in learning how to expand their u

Regardless of how soon Detroit gins to mass-produce plastic bodi plastic dies alone can radically al manufacturing methods. Metal bo dies are so costly that most car ma ers can afford a major change in d sign only once every three years.

Plastic dies, which can cut t time for re-tooling by three-quarte and the cost by two-thirds, cou permit new models oftener, and at lower tooling cost. Using plastic di to punch out steel bodies, mot makers can still offer a wider rang of body types.

The buyer appeal in automoti plastics, however, lies in the smoot sleek designs which fibre glass mak possible. With plastics, contours a possible that cannot be achieve practically, in steel.

ATTRACTIVE DESIGNS

Early in 1953, for its Motoram show, General Motors gave its ac designer Harley Earl a free hand t show his stuff. Earl's styling sectio came up with four fibre-glass plasti cars: a Cadillac "Le Mans", Buic "Wildcat", Oldsmobile "Starfire" and Chevrolet "Corvette".

The Corvette, engineered by Chevrolet's Ed Cole, was the hit of the show.

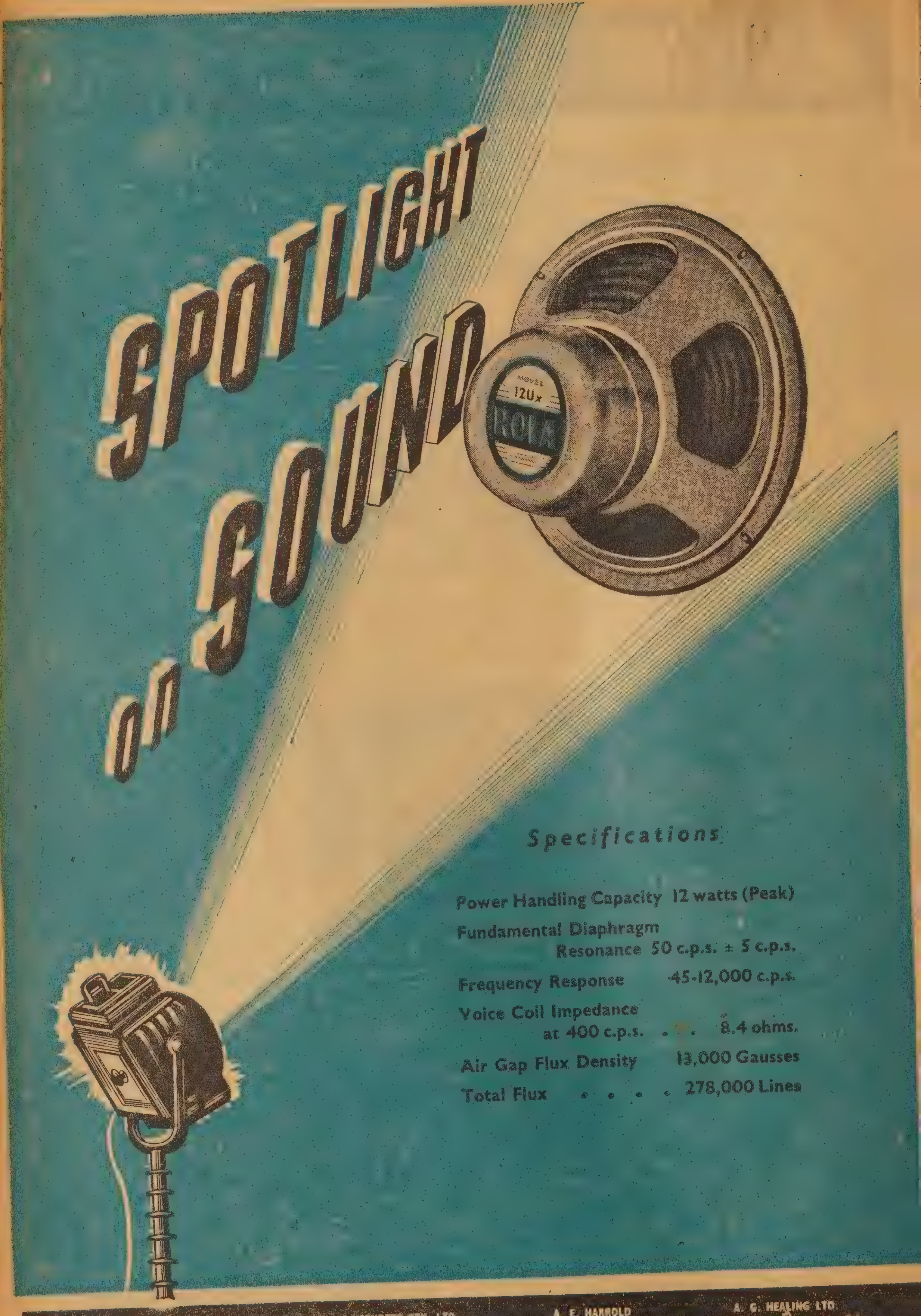
Production of the Corvette made history in the automobile industry. In less than a year it came from the designer's drawing-board to delivery off the production line. The first few bodies were hand-assembled by plastics experts. The 86 body, underbody and chassis dies and tools required to mass-produce it were produced in 10 weeks in plastic, instead of in the usual 18 months required with steel dies.

Last winter, a plastic-body experimental car was rounding a curve on the proving ground of one motor maker. The driver, seeking to avoid collision, swerved off onto a soft shoulder, lost control of the car and it rolled over three times. When the car was turned upright, not a dent was found in the body. One engineer said that a similar accident in a steel-body car would have cost the driver his life.

Chief bottleneck to mass production of plastic-body cars lies in the drying time required to harden the liquid resins which, reinforced with the fibre glass, comprise the body shell.

But plastic makers say they have fast-setting resins now available which, if produced in quantity, could

(Continued on Page 13)



Specifications

Power Handling Capacity 12 watts (Peak)

Fundamental Diaphragm Resonance 50 c.p.s. ± 5 c.p.s.

Frequency Response 45-12,000 c.p.s.

Voice Coil Impedance at 400 c.p.s. . . 8.4 ohms.

Air Gap Flux Density 13,000 Gausses

Total Flux . . . . 278,000 Lines

ATKINS (W.A.) LTD.
894 Hay Street, Perth. W.A.
HOMECRAFTS PTY. LTD.
290 Lonsdale Street, Melbourne, C.1.

W. & G. GENDERS PTY. LTD.
53 Cameron Street, Launceston, Tas.
HOMECRAFTS PTY. LTD.
100 Clarence Street, Sydney, N.S.W.

A. E. HARROLD
123 Charlotte Street, Brisbane, Q'land.
VEALLS AGENCIES PTY. LTD.
490 Elizabeth Street, Melbourne, C.1

A. G. HEALING LTD.
151 Pirie Street, Adelaide, S.A.
AND ALL LEADING WHOLESALERS.

HEARS WHISTLE, DRAWS A CURVE

Guided missile flight test data, radioed back to earth as a bedlam of scrambled sound, can now be automatically recorded, unscrambled, decoded and transferred to performance curves ready for inspection by engineers. New equipment does in two days what would be a full-time occupation for a hundred men.

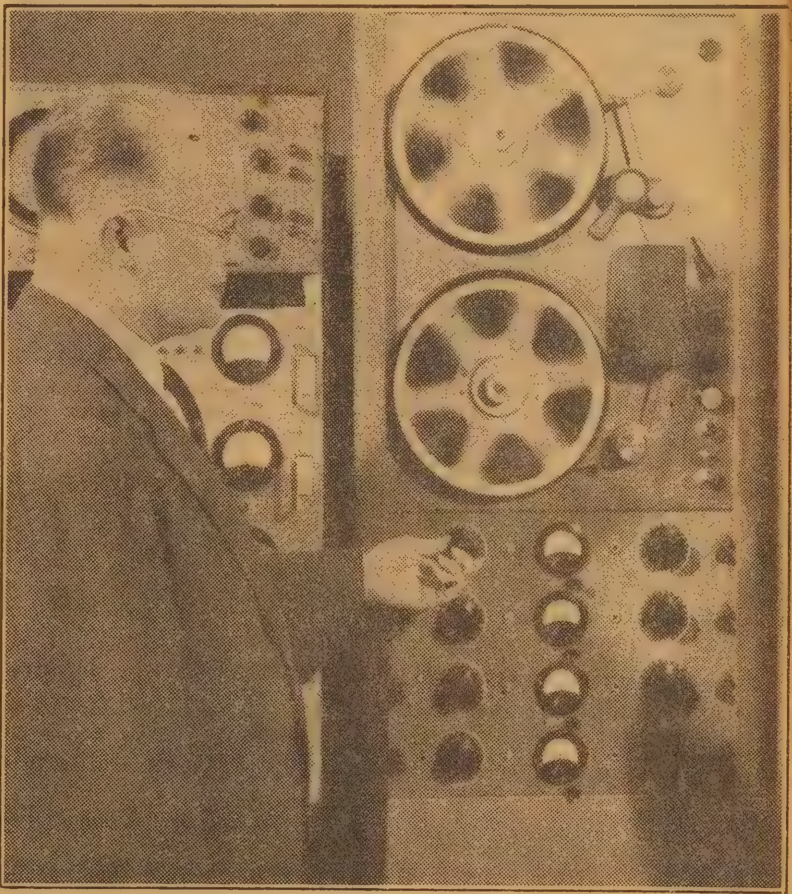
THE new device, described as an automatic data reduction machine, enables researchers to plot and analyse a missile's flight history in two or three days — a job which formerly took weeks.

Today's guided missiles and other airborne vehicles carry scores of delicate test instruments. Each instrument's readings are relayed to the ground via radio as sounds which closely resemble variable-pitch violin notes of great purity. Deviation in pitch denotes variation in readings.

All the readings must be broadcast simultaneously by two or sometimes three transmitters located in the missile, since space and weight limitations preclude a separate transmitter for each instrument. The new machine unscrambles the readings — as many as 30,000 per minute — and classifies them accurately.

Among the data captured for appraisal by a specially designed tape-recorder are measurements of speed, heat, stresses and forces, steering signals and engine performances.

Each king-size recording tape has four sound tracks. One track contains necessary timing information, a second measures vibration, and the other two hold the bulk of the test data. Each of the latter contains typically more than 60 information channels.



Here is the tape recorder section of the new instrument, developed by Lockheed and demonstrated by the company's electronics engineer, R. E. Rawlins. In operation, as many as 30,000 readings per minute are recorded, which are later unscrambled by the data reduction equipment.

The tape recording's multi-channel message is played to a discriminating audience — an electronic instrument which unscrambles the composite sound and selects the channel desired. This information is fed into an electrical impulse converter which controls a standard accounting-type card-punching machine.

When the data are in punched-card form, they can be computed electronically and the cards arranged and fed into an automatic plotting machine. End result: The data are recorded on ordinary graph paper as curves for study and appraisal by engineers.

To get all of the thousands of readings on separate cards takes the new machine about two days. The same job might be done by a special force of 100 men working full time, but with a much greater probability of error than possible for the machine.

The new device — the first ever to convert this class of radioed signals directly into numbers — was built to satisfy increasingly higher data handling requirements brought about by successful new missile flight techniques.

NEWEST CARS WON'T DENT OR RUST

(Continued from Page 11)

be reduced in cost to make mass production feasible. In any case, a year or two would be needed to build the resin production capacity to supply the automotive industry.

The real revolution will come when someone manages to punch plastic body parts from plastic dies without any time taken for "curing".

One plastic maker envisages replacing Detroit's huge, costly, metal-stamping presses with a battery of automatic machines as simple as a row of pants-pressers.

Another plastic maker sees a rebirth of small body businesses. As he sees it, several custom-body makers can set up shop using plastic dies, pressing out a myriad of body designs to fit the chassis made in Detroit. One such company in Massachusetts is now supplying plastic bodies to fit every Ford or Mercury chassis simply by changing the size of the doors.

But as you watch your wife (or yourself) crumple that fender backing into a lamp post, and painfully contemplate the coming repair bill, you can dream of the day when your plastic-body car can be patched by Junior, working with a little powder and liquid.

And you can look forward to the day when your squeak-proof, dent-proof, rust-proof automobile (even the frame and bumper could be plastic) won't look too much like many other cars on the road—if any.

ENGLISH buyers are to be offered a three-wheeler car for £225.

This price includes sales tax, which is 50 pc of the wholesale price.

The car seats two adults and two children and is reputed to do 80 miles to the gallon.

First production models should be ready in March.

Awesome in its violence is this spectacle of an exploding atom-bomb. Fortunately, however, intensive research into nuclear phenomena has opened up completely new and beneficial approach to many current scientific problems.

NEW RESEARCH WITH 'HOT' ATOMS

When the first atom-bomb was dropped on Japan the world was horrified at the implications inherent to the fact that man could release atomic energy with such devastating force. Although fear of this terrible weapon still exists, it has since become somewhat tempered by the knowledge that perhaps the world will ultimately benefit from this energy.

by Calvin Walters

T was natural having discovered how to release the energy from he atom that man would direct his energies to the peace-time use of this energy.

Whilst progress has been made with the use of atomic energy for the production of heat and power, there still remains a lot to be done before this is a commercial proposition.

There is one branch of atomic science in which great headway has been made and, as this is a very interesting sidelight, this article will be solely devoted to the uses of what are known as "radioactive isotopes".

NUCLEAR PHYSICS

Now it is necessary to introduce a little nuclear physics at this stage in order to explain just what a radioactive isotope really is.

I implore the reader not to get alarmed and turn over to another article, because what I am going to say will not be at all difficult to digest. No other article will be as good as this one anyway (with apologies to the editors).

All atoms have the same constituents but not in the same proportions.

The atoms of every element consist of at least three fundamental particles namely the proton, neutron and electron. The proton is a particle which carries a positive charge of electricity. The neutron is almost the same size as a proton but carries no electrical charge. The electron is a very small particle and carries a negative charge of electricity of the same value as the proton but of the opposite polarity.

The protons and the neutrons are in the nucleus and the electrons revolve around the nucleus like the planets around the sun.

The normal atom is electrically neutral and there are the same number of electrons revolving around the nucleus as there are protons in the nucleus.

All atoms which have the same number of electrons have the same chemical properties, notwithstanding the state of the nucleus.

It is possible for one nucleus to have a different number of neutrons from another nucleus but, if both these have the same number of electrons revolving round them, they will be atoms of the same element with the same chemical properties.

ISOTOPES

These atoms with a difference are called isotopes. Thus an element might consist of a mixture of atoms which have the same number of protons in their nuclei but different numbers of neutrons.

Now these isotopes can be very unstable and each one tries to become stable. This it does in various ways, the most important for our purpose being the emission of rays to get rid of the surplus neutrons.

The three rays are called alpha, beta and gamma. The first of these is a comparatively weak ray and will not penetrate to any great depth.

The second ray is the beta. This is more powerful and will penetrate to considerable depths in human tissue or metal.

The third and last, the gamma ray, is different to the two foregoing in that, while the two former emit in fairly straight lines, they are easy to count and to detect with suitable apparatus. The gamma ray on the other hand sends out secondary tracks in various directions, making it difficult to trace or find its original path.

As we will see later it is most important that we are able to trace the paths of the ray.

RADIOACTIVITY

This emission of rays makes the isotope radioactive. There are natural radioactive isotopes throughout the mineral world and, prior to the discovery of the cyclotron and the modern nuclear reactor, these were the only isotopes with which experiments could be performed.

With the introduction of the nuclear reactor which makes the ingredients of the atom-bomb, it is possible to manufacture a vast quantity of radioactive isotopes by subjecting the required element to the influence of the intense radioactivity going on in the reactor.

This is done by enclosing the element, it may be sulphur, phosphorus, calcium and so on, in an aluminium container and lowering it into a nuclear reactor. Here it is left a predetermined time to be subjected to the intense radioactivity. At the end of that time the can is removed and the element within is now a radioactive isotope of sulphur, phosphorus, calcium and so on.

How this change takes place is another matter of nuclear physics which I do not intend to touch on here as, no doubt, you have had enough so far.

Another method of producing these isotopes makes use of the bars of uranium which have been used in the nuclear reactor. These bars, because of changes brought about in the reactor, contain a very large number of chemical elements which are extracted by a complicated process as radioactive isotopes.

Having now dealt with the definition and production of radio-active isotopes we will proceed to discuss their uses.

For a full understanding it is necessary to keep in mind that these isotopes emit rays of various kinds and that methods have been devised to detect and trace the paths of these rays.

GEIGER COUNTER

The most widely used instrument for this purpose is the well known Geiger counter. This instrument functions by means of the entry into a tube of one of the rays. This causes the gas within the tube to become electrically ionised and thus enables it to operate a circuit which produces a series of pulses according to the number of rays entering the tube. The Geiger counter can thus trace the paths of some of the rays.

In use, the radio-active isotope is called an "isotopic tracer" and the discovery of the chain reacting uranium pile has contributed vastly to the knowledge of them.

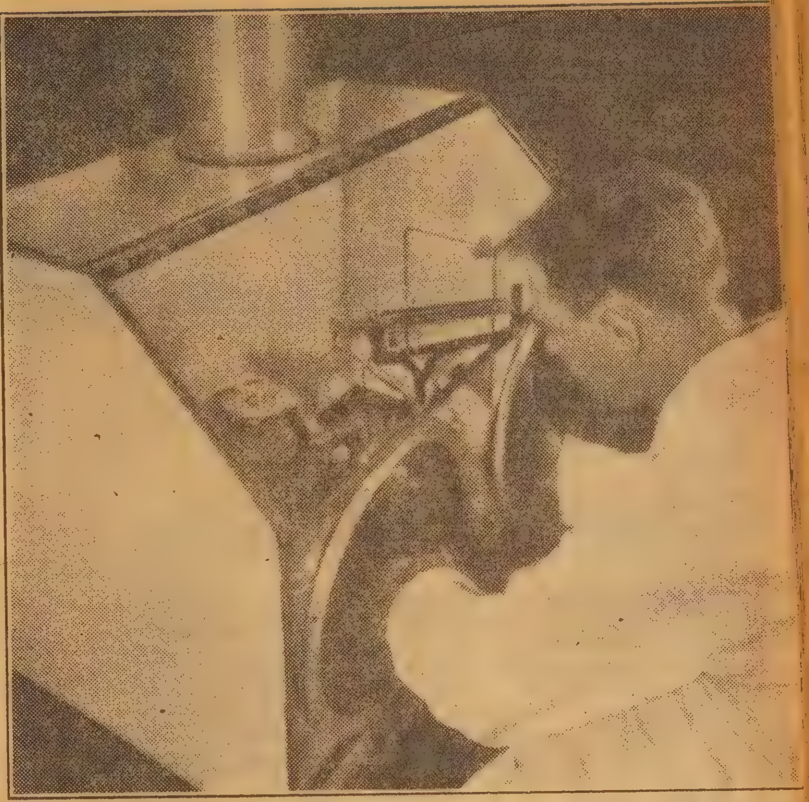
Because of the uranium pile's capacity to produce a continuous and large intensity of neutrons, it is now possible to prepare an almost unlimited quantity and variety of radioactive isotopes.

Thus we have among the radioactive isotypes hydrogen, iron, copper, carbon, zinc, calcium, potassium, cobalt, sulphur, phosphorus, chlorine and iodine. As these elements are essential to life, it follows that being able to produce these in radioactive form has given a tremendous impetus to the study of the action of these elements in the human body.

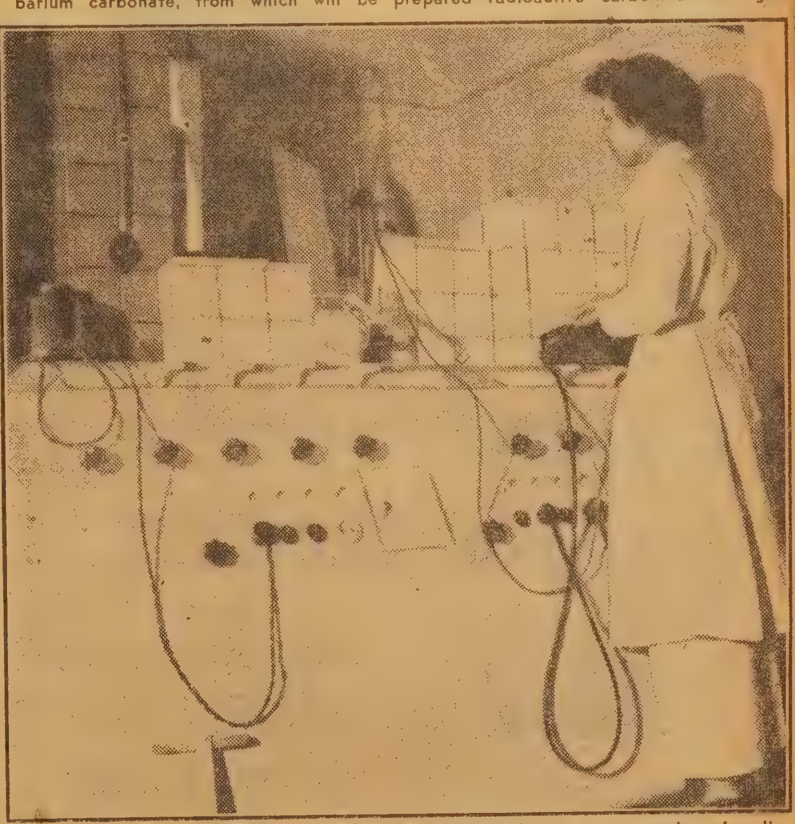
WHERE THEY GO

It is obvious that, if the course of these elements were able to be followed through the body after being swallowed or injected, it would be possible to find just what chemicals were used by different parts of the body and what happened there. It would also be possible to find whether any portion of the body was functioning properly in that the elements eaten with our food were actually reaching the places where they belonged.

One method employed to trace the course of the element through the body is simplicity itself. A Geiger counter tube is grasped in the hand This tube is heavily shielded with lead to obviate the possibility of it being actuated by condi ions outside



Radioactive indicators are coming into wide use for plant research, particularly the absorption of plant foods. Here scientist is shown weighing a sample of radioactive barium carbonate, from which will be prepared radioactive carbon dioxide gas.



An operator at the Harwell research station (England) prepares samples of radioactive gold in colloidal solution, intended for cancer treatment. The operator wears protective clothing and is further shielded for radiation by interlocking lead bricks.

'SERVISOL'

THE Solution for removing instantly resistance in all Electrical contacts, switches, relays, etc., WITHOUT DISMANTLING

½ PINT TIN
SERVISOL
CONTAINS ETHIUM
INSTRUCTIONS
SERVISOL LTD.
NETT TRADE

TO USE

Simply put a few drops on

NOISY VOLUME CONTROLS

SWITCHES

VARIABLE CONDENSERS

VALVE PINS

ON ALL ELECTRICAL

CONTACTS

and unwanted resistance

Instantly disappears!

★ 'SERVISOL' Not only cleans switches, electrical contacts, relays, etc., but restores a film of lubricant which prevents oxidisation and corrosion.

★ 'SERVISOL' is used by the BRITISH BROADCASTING CORPORATION LEADING RADIO AND TELEVISION MANUFACTURERS P.M.G. and ALL technically sound SERVICE ENGINEERS and its efficiency has been proved over a period of many years. A good service department is never without it.

★ 'SERVISOL'

★ 'SERVISOL' IS A RADIO TRADE COMPONENT and as such can be obtained through your radio and electrical wholesaler.

SOLE AUSTRALIAN AGENTS:

JACOBY MITCHELL & CO. PTY. LTD.

BX3446 (5 LINES)

Sales and Showrooms, 277 Clarence Street, Sydney.

MADE BY SERVISOL LIMITED, ENGLAND.

the body. The radioactive element is then taken by mouth and the time noted for the counter in the hand to begin to operate.

Of course, it is not necessary to always have the counter held in the hand. It can be applied to any part of the body.

An instance of this is the diagnostic method of using radio sodium in investigating the diseases called peripheral vascular diseases. These are diseases of the blood circulation whereby a certain portion of the body may not be receiving its correct supply of blood with the result that that portion of the body may die.

For the investigation of this disease radio sodium is injected into a selected vein and the speed with which this sodium reaches the foot is measured with a shielded counter tube placed against the foot.

COUNT INCREASES

The count from the tube increases as more and more of the sodium reaches the foot until a maximum is reached when the number of radiosodium atoms reaching the foot equals the number returning to the circulation from the fluids of the foot.

This equilibrium is established at a certain rate for a normal individual or according to the severity of the disease. Sometimes comparisons are made between the two legs to estimate the relative extent of the disease.

This method of tracing is very useful in determining the result of treatment, for it shows whether the limb is responding. It is also an important aid in determining the site of an amputation if that becomes necessary. It has already, in hundreds of cases saved the amputation of a whole limb which would have been the case were the old hit or miss method used. This is because the radio sodium tracer method was able to "see" at what point in the limb the disease had reached.

A most important development has been the discovery that when radiophosphorus is injected into women with tumors of the breast there is a large increase of radioactivity over the surface of the tumor when it is malignant, while this is not so with tumors which are not malignant.

REVEALS TUMOR

The reason for this appears to be that malignant tissue, having a high rate of growth, accumulates more of the radiophosphorus and thus will reveal the tumor nearby.

One great disadvantage of this method is the fact that radiophosphorus emits no rays which penetrate to a depth of more than one centimetre in human tissue. Thus the method is limited to the study of tumors somewhat near the surface. Until a radioactive element which emits more penetrating rays and which will accumulate in malignant tissue is found this method will remain somewhat restricted but nevertheless extremely valuable.

There are many other applications of the tracer technique in medicine and biology, but space does not permit of further examples.

In engineering, a useful application of the tracer technique lies in the study of friction and wear. The results of friction include the transfer of metal from one bearing surface to another. This metal is very difficult to weigh, but if one of the metals is made radioactive by adding a small amount of an isotope to that metal, then the transferred metal can be detected by means of a geiger counter and its quantity estimated.

In this way the efficiency of various alloys used for bearings can be estimated. The same method can be used in studying the efficiency of metals used in piston rings and cylinders. A small quantity of the isotope is included in the steel from which they are made. After a given running time the cylinders or piston rings can be examined for transferred metal. The amount of metal in the lubricating oil can also be traced with the counter.

On an electroplated surface an isotope can be added to the plating bath. Thus any of the plating worn of by friction can be found whereever it is deposited.

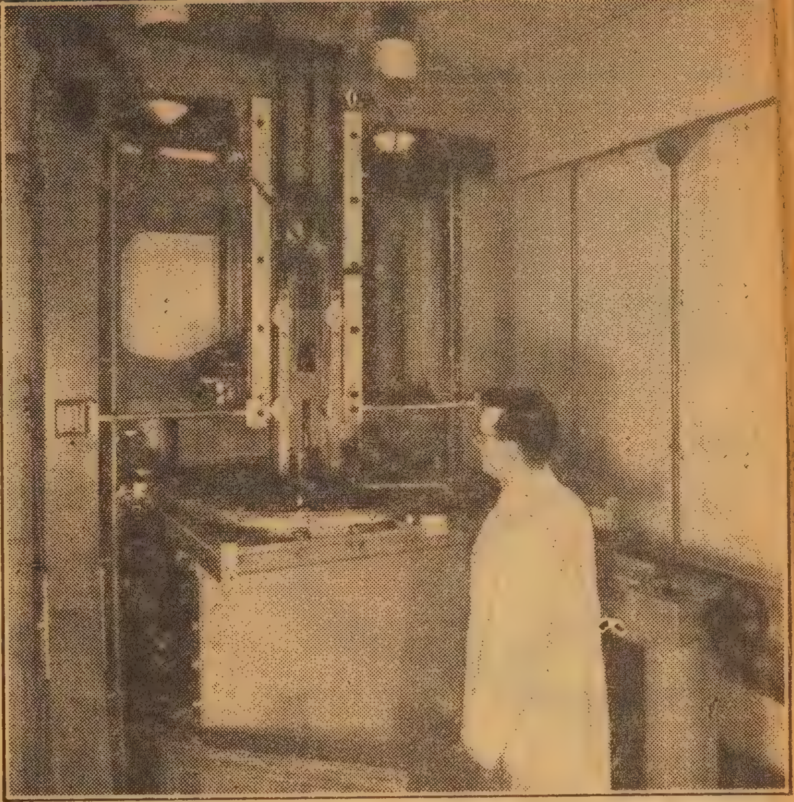
The amount of worn metal in lubricating oil can be determined by immersing in it a photographic plate. After a suitable exposure the plates are removed and the blackened exposed surface measured with a densitometer. The quantity of the worn metal in the oil can thus be calculated by suitable means.

The process of electroplating can be followed by using a radioactive isotope of one of the chemicals in the plating solution. In this the rate of disappearance of the isotope from the solution is an index of the rate of deposition on the article to be plated.

Isotopes are finding applications —

(Continued on Page 104)

BRITAIN'S FIRST "BREEDER" PILE



"Zephyr," the zero energy fast reactor at Harwell, went into operation recently. The objects of "Zephyr" are to obtain experience with a fast reactor and gain information (about control systems, nuclear constants, materials and methods of reactor construction) obtainable only by actual operation of a reactor.

The fast reactor has characteristics which make it likely that most of the uranium atoms in natural uranium can be consumed by the process known as "breeding". If this system can be developed, a nuclear energy electricity generating system should operate with a much smaller supply of fuel than in the case of natural uranium or slightly enriched uranium thermal fission reactors. Reactors previously built and now in use in Britain—two at Harwell and two at Sellafield—use uranium rods enclosed in graphite which acts as a moderator to slow down neutrons produced by fission.

The design of "Zephyr" has largely been the responsibility of the Reactor Physics Division at Harwell.

The reactor is contained in the cube in the lower half of the picture. The lifting gear over the centre of the reactor enables that part of the uranium blanket which lies above the core to be lifted clear of the reactor; the remainder of the blanket can be lowered to provide access to the core. The control and safety devices operate from beneath, and are not visible in this picture.

SPECIALS FROM THE AUDIOTORIUM

High Fidelity Sound Centre

. 20-5A HIGH FIDELITY AMPLIFIER

h the new improved Fidelity Control Unit

9/17/6

THORENS

AUDIOMATIC CBA 83

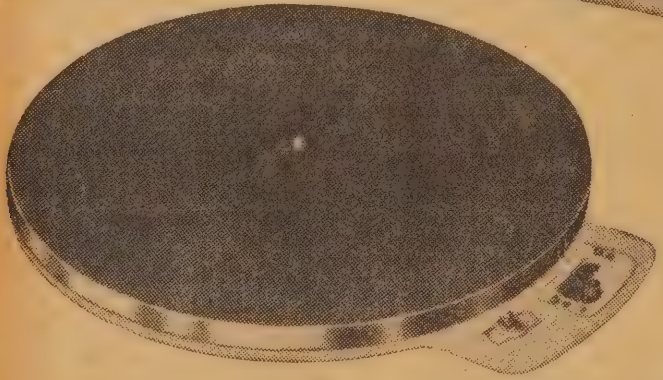
utomatic Record Player

ith G-E Variable Reluctance
Pick-up and Sapphire Stylus

£46/15/-

53-PA
PRECISION
URNTABLE

30/2/6



WANTED !

AUDIO ENGINEER for development work on high class Audio equipment.

YOUTHS . . . for wiring and assembly work of sound equipment. Ring BX 6731 for appointment.

THE AUDIOTORIUM

A Division of Audio Engineers Pty. Ltd.

422-4 KENT STREET, SYDNEY **'PHONE: BX6731**

Technical Review

CBS RESURRECTS "STEREOPHONIC" SPEAKER SYSTEM

The artificial stereophonic effect gained by remotely placed bass and treble speakers has been further investigated by the American CBS Laboratories. In this article reproduced from a recent issue of "Audio Engineering", P. C. Goldmark recounts the experiments which led his company to adopt the scheme as the basis of their "XD" (Extra Dimension) system.

AFTER the LP records were launched and well under way, the laboratories' attention was turned toward investigations in the field of spatial sound.

I am using the expression "spatial" in order to differentiate between the effect created by sound radiated from a hole in the wall (or a cabinet) and sound reaching the listener from different directions.

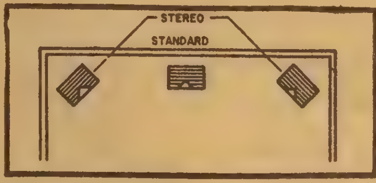
The former has been the standard way of listening and emphasises the synthetic nature of present-day music rendition.

NEW DIMENSION

Keeping in mind that reality is the most important ingredient of a reproducing medium catering to one's senses, we felt that to add to sound a new dimension, rather than just another octave or two, was our most urgent step.

In the case of the phonograph and the radio, the desired effect had to be created at a low cost, at the same time using existing records and broadcasts.

There are two expressions which one hears frequently in connection with spatial sound: One is BINAURAL and the other is STEREOPHONIC.



Arrangement of speakers to determine listener preference for various systems.

The first one involves listening to a program through earphones. By definition the binaural effect depends upon the selective perception by one's ears of different signals picked up by two suitably located microphones and recorded or broadcast on two channels.

There is no question at all about the life-like reproduction of the original sound properly distributed in space.

But people today are used to listening to sound through loudspeakers. This brings up the other form of spatial sound rendition, namely, the stereophonic technique.

Again, the original signal is picked up by two or more microphones and transmitted or recorded on a corresponding number of channels. However, the sound is reproduc through two or more loudspeake suitably located in a room. This where the trouble begins.

To obtain the same natural effe as in binaural sound, it would necessary that the loudspeaker the right (if two are used) be hea only by the right ear and the or on the left by the left ear.

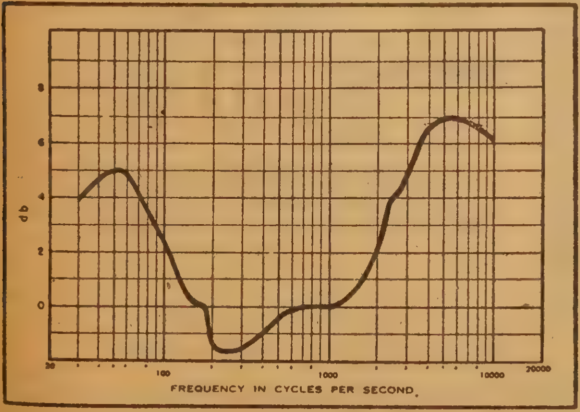
The use of polaroid glasses three-dimensional movies is th visual analogy; unfortunately, suc has not yet been achieved and th sound from the right speaker penetrates the left ear and vice versa.

As a result, much of the binaurality is lost, and the listener ma simply hear reproduction throug two loudspeakers.

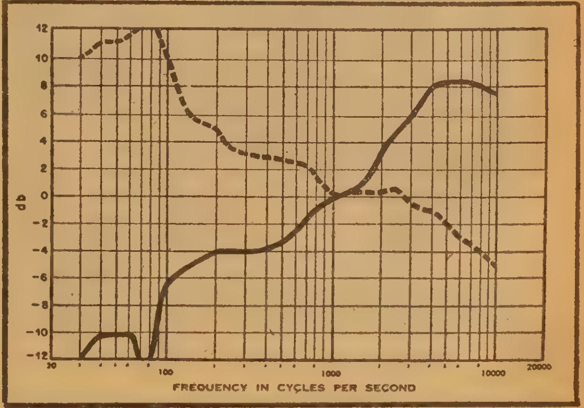
NOT STARTLING

Thus, when demonstrating stereophonic sound using two loudspeaker placed in adjacent corners of a room, only a diluted effect results. Further, it is confined to a very limited area of the room, chiefly along an axis halfway between the two speakers.

Even then, a non-stationary sound source, such as a singer or actor moving about, or a speeding locomotive, is needed to give a convincing demonstration. This does



Amplitude characteristic of the "360" in normal use without the XD speaker plugged in.



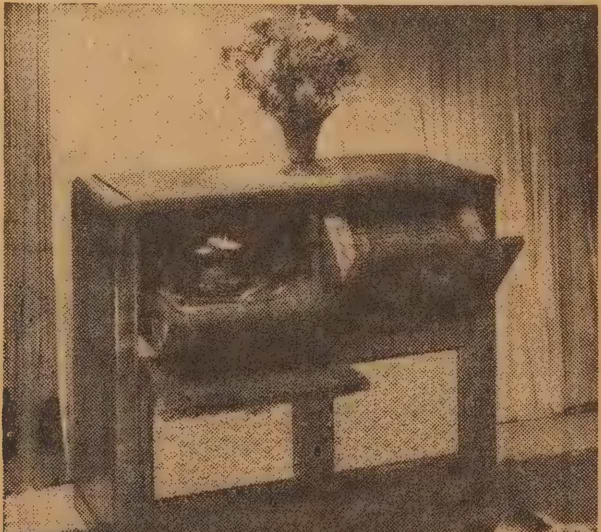
Responses of the "360" and the XD when the latter is plugged in. Note that decibel scale is different.

BIGGER PROFITS FOR YOU MR. RETAILER

Zenith brings you magnificent models to offer your clients under your own brand name. Precision built to ensure better performance and housed in exclusive and superior cabinets, Zenith radiograms just sell themselves. At our prices you can cope with "trade-ins."

- C67—5-valve world range receiver, automatic, 3-speed record changer for microgroove and standard records, 7", 10" and 12". Superb American-style cabinet of selected veneers. Large record storage cabinet.

- C73—De luxe automatic 3-speed radiogram. World range receiver. 12" speaker.



Some territories still open for franchise!

Apply now and become one of the happy Zenith Retailers. You can have exclusive models in your town.

Write NOW for details of the sensationally low radiogram prices.

Zenith

RADIO COMPANY PTY. LTD.

123 Palmer Street (off William St.)
Sydney. FA 2157-8
***Q'land Rep.:* N. C. Tritton**
Old Courier Mail Bldg.
Queen Street, Brisbane

MANUFACTURERS TO THE TRADE ONLY

25 years of unequalled service

not, however, represent practical conditions, since most people listen to music which is static; that is, the performers stay in one place.

In the course of our three-dimensional sound research, several of the recording sessions of Columbia records were picked up by two properly located microphones and the respective sounds were simultaneously recorded on two tracks.

This provided suitable material for binaural and stereophonic sound experiments and also permitted the study of systems which would simulate stereophonic reproduction, combining both tracks into a single one.

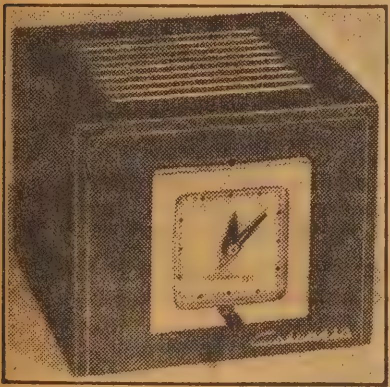
During this research program, a number of basic experiments were performed and only the most decisive ones will be discussed.

TEST TAPE

Several selections from the stereophonic recording sessions were spliced together to form a suitable demonstration tape. Played back binaurally—that is, with headphones—the tape proved to give a very clear three-dimensional effect.

Next, a listening room was equipped with two high-quality loudspeakers placed in adjacent corners facing the listeners. A third speaker was placed in the centre of one wall, as shown in the diagram.

In addition, a switching arrangement was provided whereby the dual program tracks could be reproduced under three different conditions as follows:



The Columbia "XD" remote speaker, combined with an electric clock.

CONDITION 1. The two tracks corresponding to the left and right microphones were electrically combined and fed directly to the centre speaker. This was equivalent to conventional single speaker sound reproduction.

CONDITION 2. The left hand sound track was fed to the speaker in the left corner and the right track to the speaker in the right corner. This system corresponded to true stereophonic reproduction.

CONDITION 3. The two tracks were again electrically combined as under Condition 1, but before the resultant signal reached the left speaker, it passed through an equalising circuit which attenuated the lows and emphasised the high frequencies. The right speaker also received the combined signal, but through an equaliser which attenuated the highs and emphasised the lows.

Listeners were invited to these tests without being told what the conditions were. They were asked to express their preferences of sound reproduction by choosing from any one of the three conditions outlined above.

The result of the study was startling but in some respects not unexpected. While not a single listener (of a total of 50) preferred Condition 1—that is, the single conventional speaker — their preferences were almost equally divided between Conditions 2 and 3.

GOOD ILLUSION

Evidently, the simulated stereophonic sound seemed to give as much satisfaction as the true one.

As a matter of fact, when people began to wander around the room, more listeners preferred the simulated stereophonic rendition (Condition 3) because it seemed to give satisfactory results over a less restricted area than the true stereophonic sound.

A variation of these tests was performed on a number of listeners who were technically or musically well informed on the state of the stereophonic art.

These listeners were told what the three conditions corresponded to and were asked to determine which Condition, 2 or 3, represented the true stereophonic rendition.

Half of them guessed right and half of them guessed wrong, again proving that true stereophonic rendition can be successfully simulated with a single source of program.

Another series of tests indicated that stereophonic rendition could be less easily simulated by a program—fed in identical fashion to tw speakers — than by listening to th same two speakers, each with a di ferent frequency balance.

This was to be expected becaus one of the important characteristic of stereophonic sound is the difference in spectral composition betwee the sound radiated from the reproducing speakers.

From this stage on the norma single track records were used instead of the double track recordings

Encouraged by the experiments, simple and inexpensive system wa tried which resulted in the new Columbia XD system.

The Columbia "360" player was provided with a jack in the back to accommodate the XD speaker. This was not just an extension unit but part of the over-all simulated stereophonic system identified as the XD (Extra Dimensional) sound.

COMPENSATION

The frequency characteristics of the "360" itself and of the separate speaker have been so fashioned that, when plugged in, the jack of the external speaker causes a roll-off of the highs and emphasis of the lows in the "360" player.

At the same time, the external speaker assumes the required opposite characteristic; namely, emphasised highs and attenuated lows, exactly as determined in the previously described tests.

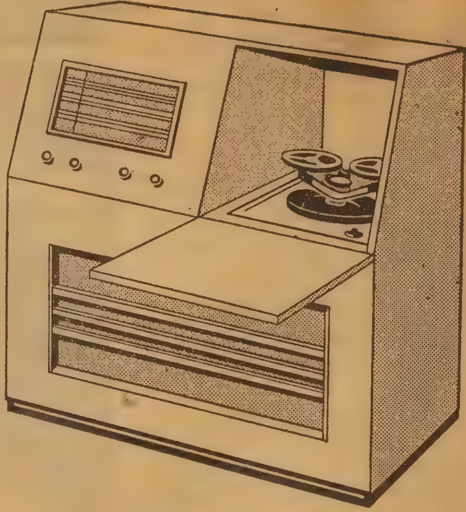
In order to conceal the identity of the box and at the same time to give it added utility, the extra speaker is housed in a small cabinet — a 7in

(Continued on Page 45)

PERHAPS I CAN HELP YOU, MADAM

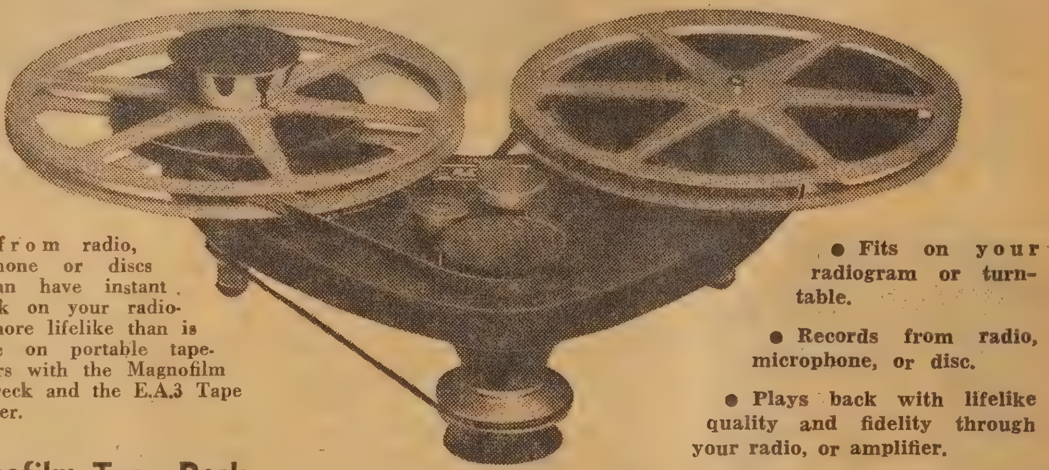
The huge "Printemps" department store, in Paris, has done away with the customary clerk's cubicle on the ground floor. Now customers can get answers to their enquiries on any floor of the building, by going to a television screen and speaking into a microphone. Television announcer Catherine Langeais, whose face appears on the screen, tells them all they want to know from a centrally situated television broadcast room.

A Tape Recorder tailored-to-fit your radiogram



with the

Magnofilm Tape-Deck and the E.A.3 Tape Converter



Now, from radio, microphone or discs you can have instant playback on your radiogram more lifelike than is possible on portable tape-recorders with the Magnofilm Tape Deck and the E.A.3 Tape Converter.

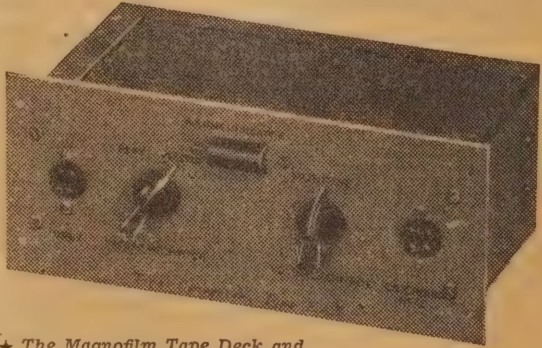
- **Fits on your radiogram or turntable.**
- **Records from radio, microphone, or disc.**
- **Plays back with lifelike quality and fidelity through your radio, or amplifier.**
- **And the COST is less than half a comparable tape recording machine.**

Magnofilm Tape Deck . . .

designed for electrically driven turntables—7 inch reels hold 1200 feet of tape, record 74 minutes at 33 1/3 r.p.m. and 32 minutes at 78 r.p.m. Tape may be erased and re-used with Magnofilm Eraser supplied.

McLellan E.A.3. Tape Converter

measures 7½in x 3¼in x 4in, installed simply on your 'gram. Assures perfect quality and fidelity in recording programmes from radio, microphone or turntable.



★ *The Magnofilm Tape Deck and the E.A.3. Tape Converter do not interfere with the normal playing ofyour radio or tuntable.*

INTERSTATE REPRESENTATIVES

Wm. J. McLellan & Co. Pty. Ltd., 126 Sussex Street, Sydney (50 yds from King Street). BX 1131 (6 lines.)

L. S. Wise & Co., 14 Pirie St., Adelaide. C. 818.

West Coastal Agency, Box K821, G.P.O., Perth, W.1838.

Athol M. Hill, Durham House, 842 Hay Street, Perth, W.A.

Byer Industries
PROPRIETARY LIMITED
BYER INDUSTRIES PTY. LTD.

8 DORCAS STREET, SOUTH MELBOURNE, VICTORIA.

NEW WIDE-RANGE PICKUP USES CERAMIC ELEMENT

One of the latest contenders for recognition in the field of hi-fi phonograph pickups is th barium-titanate cartridge. Described in the December 1953 issue of "Audio Engineering", cartridge of this type is produced in the US by Electro-Voice and is described as an "ultra linear ceramic" unit.

IN the first part of the article, the author, J. F. Wood, discusses the significance of recording characteristic curves.

He points out that the original and classic system was to record with constant-groove amplitude below a certain turnover frequency, but with a constant-velocity characteristic above this frequency.

When played back with a magnetic pickup, such a record produces level output above the crossover frequency but with a reducing output in the bass register, thereby necessitating bass compensating circuits in the amplifier.

Conversely, with a crystal pickup, bass output tends to be level, but treble response tapers downward.

The current use of treble pre-emphasis and a higher "turnover" frequency produces records which are not far removed in characteristics from constant amplitude.

This necessitates substantial correction for magnetic pickups, whose output is proportional to stylus velocity.

DIFFERENT LAW

A crystal pickup, however, with output proportional to displacement, produces something much closer to a level overall characteristic. This fact, coupled with a higher order of output greatly simplifies amplifier design.

The barium-titanate cartridge is likewise sensitive to displacement, rather than velocity, and its behavior is therefore basically similar to that of a crystal type.

Barium titanate is a true ceramic material, similar to the material used in an ordinary tea cup. However, barium titanate possesses the unique ability to generate an electric charge when subjected to mechanical stress. This phenomenon is known as the piezoelectric effect.

A typical element consists of two slabs of barium titanate separated by an electrode surface which may be a metal strip or a deposit of silver.

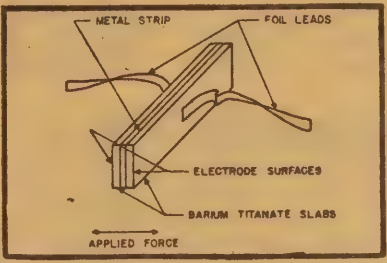
Electrodes are deposited on the outside surfaces, and the entire assembly is charged by the application of a high voltage, just under the breakdown potential. This "charge" accomplishes an orientation of the molecular structure and produces piezoelectric sensitivity.

SERIES CONNECTED

A bending force applied to the element will stress one side in tension and the other in compression. The generated voltages of the two slabs are usually added in series to provide maximum output.

While the piezoelectric effect has been widely used in cartridges with Rochelle Salt or ammonium dihydrogen phosphate (ADP) generating elements, certain characteristics limited their use for the conventional home phonograph.

The higher output voltage of the Rochelle Salt element is offset by its susceptibility to damage by excess humidity and heat or extreme dryness.



Construction of the barium-titanate element is similar to the conventional crystal head. Barium-titanate has much superior mechanical properties.

ADP is better in these respects, but has a much lower dielectric constant.

On the other hand, the barium titanate element is completely resistant to moisture, is unaffected by temperatures up to and above 212 degrees F., is relatively strong, and has a very high dielectric constant. The sensitivity of this element, while somewhat lower than Rochelle Salt at 72 degrees F., is of the same order and does not ordinarily require changes in associated equipment.

The temperature output curve of barium titanate is relatively flat.

Because of a dielectric constant four and one-half times greater than Rochelle Salt and an ultimate strength approximately five and one-half times greater, a practical titanate element can be much smaller in all dimensions.

Accordingly, the effective mass of the element and associated drive mechanism is much less.

In the last few years, ceramic cartridges have been available for use in commercial home phonographs. A ceramic of this type has sufficient output voltage to replace the majority of Rochelle Salt units. However, response has been restricted to 4000 to 5000 cps often deliberately.

In contrast to this performance, basic requirements for the Ultra-Linear ceramic cartridge were set up as follows:

1. Frequency response was to fall within 2½ db of the New Orthophonic curve throughout the range of 30 to 15,000 cps without requiring equalisation in associated equipment.

2. Output voltage was to be adequate to drive standard amplifiers without preamplification.

3. High lateral compliance with maximum allowable damped vertical compliance consistent with mecha cal stability in arms and changer

4. The stylus should be repla able and of a standard type.

Reinforcing the high-freque response above the constant amp tude level a required amount is of the most important problems adapting an amplitude device to complex curve such as the Orth phonic characteristic.

This is often accomplished allowing the system to resonate this range and damping to the c sired level. The result is a som what peaked response falling rapidly above resonance.

Needle impedance can becor quite high in such cases, produci mis-tracking, distortion and actu damage to the record groove.

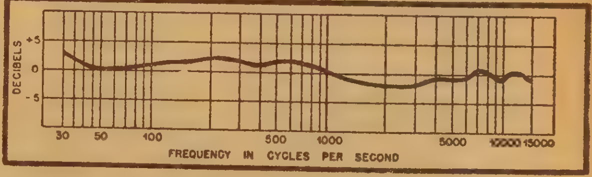
DAMPING

Damping is necessary in any car ridge and can be applied in a numb of ways. Common practice is to re on materials such as viscoloi audioid, and various rubber con pounds.

While they are usually necessar for mounting and restraining th element, undesirable stiffness an temperature instability result if thes materials are used entirely.

If a viscous material is utilised a a fulcrum or restraining medium o the element, the applied force o "drive" is greater at the higher frequencies where the velocity is increasing. Thus it is possible to incorporate a resistance for damping purposes and, at the same time, to reinforce the high-frequency response. A very low "Q" can be obtained, which is essential for a smooth response.

Frequency response of the Electro-Voice model 84 ceramic cartridge under conditions outlined in the text.



Viscous loading of the element is used in this cartridge by surrounding the ceramic with a viscous material. Coupling to the viscous material is adjusted to the correct value by means of a small metal vane attached to the mid-point of the ceramic.

The material itself is a silicone prepared for this application in which values of viscosity, plasticity, mass, and stiffness have been established for optimum results. Silicone has excellent chemical and physical stability, particularly with respect to temperature.

The low-frequency response of a ceramic cartridge is directly dependent upon the value of load resistance.

A minimum load resistance of 3 megs is recommended for flat bass

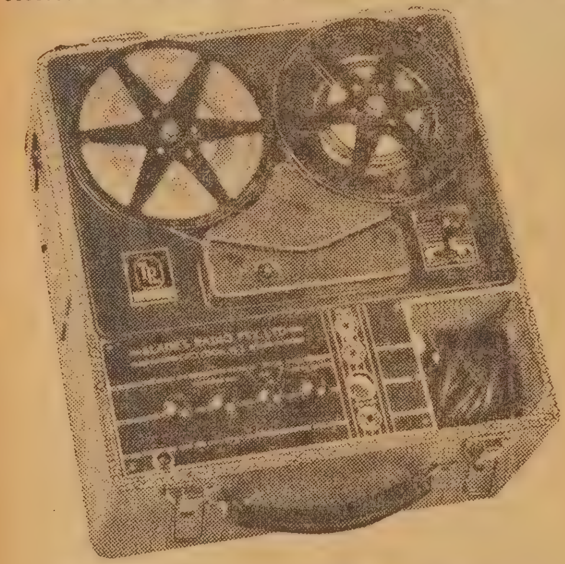
(Continued on Page 105)

AUSTRALIA'S MOST POPULAR Radiogram Cabinet NOW made SUITABLE for INCLUSION of TAPE RECORDER

MODEL 508 C.T.
Length 5ft 3in, Width 20in, Height 32in

Made from best quality Maple and Italian Walnut. Finished with a brilliant piano finish in Natural Colour Blonde or Rosewood. Labyrinth fitted. Suitable for 12in speaker.

ORDINARY 508 STILL AVAILABLE



The Famous Sound Mirror Tape Recorder

Now manufactured by

Slade's Radio Pty. Ltd.

The professional Quality Tape Recorder you have been waiting for. 40-8000 cycles at 7½" per second assures perfect reproduction under all conditions. No more expensive records to buy. Record your own from the Radio Set, play them back as often as you like. Erase when you are tired of any particular tune and re-record another. Listen to all other Tape Recorders available but before making your choice compare the Slade Sound Mirror.

The ideal recorder for Music Teacher, Elocution Teacher or Business Man.
Price £146 Complete with Microphone, Tape and Free Tuition.
Sound Mirror Tape Decks available. Price complete **£62/-/-**

SLADE'S RADIO Pty. Ltd.

UJ5381 :: LANG STREET, CROYDON, N.S.W. :: UJ5382
Established 30 years

NEWS AND VIEWS OF THE MONTH

A new battery

In a one-room laboratory off a tennis court in Cambridge there is a machine which may hold great promise for the future.

It will make electricity out of gases.

This could lead to the development of a really efficient form of electric battery, for which the world has been searching ever since electricity was put to work.

The machine works by combining hydrogen and oxygen to form water —a reversal of the process known as electrolysis.

Behind this new development of the "fuel cell" is engineer F. T. Bacon, who has been working on the process since 1946 with the support of Britain's Electrical Research Association and the Ministry of Fuel.

The fuel cell may have important uses when it is perfected—cylinders of compressed gas offer an easier way to store energy than do normal electric "batteries".

When hydrogen and oxygen are made to combine in Bacon's fuel cell, water is formed and energy released in the process is channelled off as electric current.

It is estimated that for all output above one or two kilowatts the fuel cell will prove lighter and more efficient than ordinary accumulators.

In the latest issue of Beama Journal, which is devoted to the British electrical industry, Bacon lists some possible uses of the fuel cell:—

- To drive rail engines on lines that have not yet been electrified.
- To power road vehicles where it is important to have a silent, vibrationless engine whose only exhaust is water.
- To store electric power generated by windmills.
- To generate power on a large scale for low-voltage direct current needs in electro chemical plants.

Among the advantages claimed for the fuel cell are efficiency—it has nearly 68 pc efficiency as an energy convertor.

This is more than twice that of steam.

It is simple, has no moving parts, is noiseless, does not vibrate and produces no fumes.

There are some important problems still to be solved. Supporters of the device, however, claim they are the kind of snags likely to be overcome without great difficulty.

Air-to-air missiles

According to Britain's Minister of Defence, guided missiles have now reached an advanced stage of development. The past year has seen the successful testing of experimental rockets at Woomera. These trials foreshadow the most important developments in air defence since the invention of radar.

The first of these weapons will be air-to-air missiles launched from piloted fighters; they will be fitted to the Swifts and Hunters now being introduced to Royal Air Force squadrons thus replacing the standard aircraft cannon and making the fighter as a lethal weapon something like four times as efficient.

Following these air-to-air weapons will be surface-to-air weapons. A statement by the Secretary of State for Air makes it clear, however, that when the first ground-launched weapons are introduced, "they will supplement, and not supplant, the piloted aircraft".

Because of the difficulty in casting when these missiles w able to take over defensive inte tion, it is necessary to develop p fighters with speeds in level well past that of sound — th truly supersonic fighters.

Good progress has been ma designing an aircraft of this and it is expected to make its flight before long.

Silencer for jets

Scientists have developed a d which reduces exhaust noise jet engines.

The device—called a "detune is a huge metal tube which fits the exhaust.

The detuner is used on jet en in test beds.

It reduces the speed of exh gases from 1500 miles an hou 70 miles an hour.

A layer of iron baffleplates glass-rock insulating materials the tube's end slow the gases.

Workmen at the Rolls Royce Canada factory have also produce detuner, which is used in the exp mental section.

One disadvantage to the detu is the great suction it creates, there have not been any accid yet.

Atomic loco

An atomic locomotive that run for a year on 11lb of urani has been designed by a US physic Dr. Lyle Borst, a former resea officer of the US Atomic Ene Commission.

Dr. Borst said recently that locomotive was of 7000 hp.

POPULAR SCIENCE QUIZ

Q.: In what way is freon gas used in supersonic flight research?

A.: It has been reported that Freon-12, the colorless gas often used as a refrigerant in cooling systems, offers marked advantages over air as "wind" in test tunnels.

Since the power required to operate a wind tunnel varies directly as the cube of the wind speed, it becomes highly desirable to reduce the supersonic air stream to a more economical lower range of wind velocities. Because sound travels through Freon-12 at about half of its velocity through air, this Freon gas need be blown through a test tunnel at only about half as fast as air to produce supersonic conditions for a test model. This results in a great power saving in the air stream generating equipment.

In a test tunnel at Langsley Field, Va., USA, use of Freon-12 instead of air raised the maximum test-section wind velocity from Mach .4, which is four-tenths the speed of sound, to Mach 1.2. This simple modification converted the test tunnel from a subsonic research tool into a modern supersonic unit without requiring any additional power or any change in the propeller.

The gas is more easily compressed than air, however, and allowances must be made for this. It is reported that methods have been worked out for perdicting a model's behavior in air following its study in the Freon-12 wind tunnel.

Q.: What is the richest source of vitamin B2?

A.: Researches in Bombay indicate that saffron, the spice so highly prized in the Orient, is "easily the richest known source" of riboflavin or vitamin B2.

Assaying of the vitamin content by its effect on a test organism and by the use of the spectrum shows that saffron has about three times as much riboflavin as yeast or liver, considered to be one of rich sources.

Saffron is part of the flower of the plant known botanically as Crocus sativus. It is expensive because it consists of the stigmas, the parts of the pistils of this flower which receive pollen grains and o which they germinate. It is gathere laboriously by hand.

The content of thiamin or vitami B1 was found to be insignificant however.

Q.: What is a recently discovered method of controlling nutgrass?

A.: According to recent experiments carried out at the University of California Citrus Experimetnal Station nutgrass, the gardener's headache, can be controlled by fumigating soil with the herbicide known as chlorobromopropene, or simply CBP.

Preliminary field tests shows that 80 gallons of 55 pc CBP formulation per acre, injected eight inches deep with a weed gun, will give effective nutgrass control on well-tilled soils of moderate moisture.

This herbicide promises to provide a good means of spot treatment of small infestations of nutgrass. It gives immediate kill of vegetative parts of the nutgrass and does not require tarpaulins and other special equipment for applying.

LEPHONES: JA2877, JA2878, JA5881 FERGUSON LANE, CHATSWOOD

STANDARD -FERGUSON- RANGE

RECEIVER POWER TRANSFORMERS

E	PRIMARY VOLTS	HTV aside	HT mA	FILAMENTS
	240	150	30	6.3V/2A
)	240	285	40	6.3V/2A, 5V/2A
)	240	325	40	6.3V/2A, 5V/2A
1	240	225	50	6.3V/2A

E: All transformers are available with upright mounting. The following ansformers are also available with flat mtg., fitted with an adaptor e to suit 3 x 3½in centres. On removal of plate, mtg. centres become x 3 1-8in. IF flat mtg. is required afix Code No by letter F e.g. PF151F.

1	230, 240	285	60	6.3V/2A, 5V/2A
6	230, 240	325	60	6.3V/2A, 5V/2A
5	230, 240	385	60	6.3V/2A, 5V/2A
70	230, 240	285	80	6.3V/2A, 6.3V/2A, 5V/2A
59	230, 240	325	80	6.3V/2A, 6.3V/2A, 5V/2A
58	230, 240	385	80	6.3V/2A, 6.3V/2A, 5V/2A
30	230, 240	285	100	6.3VCT/2A, 6.3V/2A, 5V/2A
64	230, 240	325	100	6.3VCT/2A, 6.3V/2A, 5V/2A
60	230, 240	385	100	6.3VCT/2.5A, 6.3V/2A, 5V/2A
52	230, 240	285	125	6.3VCT/3A, 6.3V/2A, 5V/2A
63	230, 240	325	125	6.3VCT/2.5A, 6.3V/2A, 5V/2A
81	230, 240	385	125	6.3VCT/3A, 6.3V/3A, 5V/2A
174	230, 240	285	150	6.3VCT/2A, 6.3V/2A, 5V/2A
142	230, 240	325	150	6.3VCT/2A, 6.3V/2A, 5V/3A
175	230, 240	385	150	6.3VCT/2A, 6.3V/2A, 5V/3A
167	230, 240	385	150	6.3VCT/2A, 5V/3A, 2.5VCT/5A
173	230, 240	425	175	6.3VCT/3A, 6.3V/2A, 5V/3A
140	230, 240	385	200	6.3VCT/3A, 6.3V/3A, 5V/3A
171	230, 240	385	250	6.3VCT/4A, 6.3V/3A, 5V/3A

POWER AMP. AND LOW POWER T/MITTER UNITS

F172	230, 240	500	200	6.3V/4A, 6.3V/3A, 5V/3A
F143	230, 240	600 500	200	2.5V/5A, 2.5V/5A, 5.5V/.5A
F147	200, 230 240, 260	1000 750 500	200 250 300	5.5V/.3A
F179	230, 240	475	225	6.3VCT/4A, 6.3V/2A, 5V/3A
F107	230, 240	585	250	6.3V/3A, 6.3V/2.5A, 5V/3A

C.R.O. TRANSFORMERS

F188	240	350 one ext. 900	30 2	6.3V/2A, 6.3V/1A 5V. tap 4V/2A 4V tap 2.5V/2A
F545	240	350 one ext. 1000	20 1	6.3V/3A, 6.3V/.6A, 4V tap 2.5/2A

TAPE-RECORDING TRANSFORMERS

PF642	230, 240	250	80	6.3V/3A, 5V/2A Low radiation
PF664	240	265	80	6.3V/3A, 5V/2A Low radiation

PHOTOFLASH TRANSFORMERS

HT119	200	4000 ½ wave		
HT131	240	1100 ½ wave		prim. also vib, 5.2 or 4V

POWER CHOKES

CODE NO	IND HY.	DC RES.	DC MA
CF100	50	1900	10
CF101	30	870	25
CF102	15	300	60
CF103	30	420	60
CF104	30	580	80
CF105	15	250	80
CF106	12	200	100
CF107	30	360	100
CF108	12	135	150
CF109	20	225	150
CF110	12	100	200
CF111	16	165	200

CODE NO.	IND HY.	DC RES.	DC MA
CF112	10	70	250
CF113	5/20	70	50/250
CF115	.017	.6	2A
CF119	.005	.1	6A
CF162	10	90	330
CF196	20	130	125

CF114*	40 watt fluor ballast
CF213*	20 watt fluor ballast

* Fitted with rubber mounting to reduce hum. Standard 5¼in hole centres.

VIBRATOR AND A.C. POWER TRANSFORMERS

CODE NO	PRIMARY VOLTS	HTV aside	HT mA	FILAMENTS
PF182	240AC 12VIB	200	40	12.6/1A
PF122	240AC 6VIB	220	40	6.3V/2A
PF125	240AC 6VIB	250	60	6.3V/2A
PF126	240AC 12VIB	250	60	12.6VCT/1A
PF119	240AC 6VIB	325	125	6.3V/4A
PF146	200, 230, 240 AC 12VIB	325	150	12.6VCT/2.5A

VIBRATOR TRANSFORMERS

CODE NO	PRIM VOLTS	DC Volts	O'put mA	Buffer Full Sec	
VT101	6	90	15	.008	
VT102	6	150	25	.005	
VT103	6	200	50	.005	
VT127	6	200	50	.005	Low radiation. Car Radios
VT104	6	250	60	.005	
VT107	6	250	60	.005	Low radiation. Car Radios
VT106	6	300	75	.008	
VT122	6	400	50	.005	
VT146	12 or 6	240AC	50w	1MFD	For Emergency light, etc.
VT112	12	200	50	.005	
VT132	12	200	60	.005	Low radiation. Car Radios
VT105	12	250	60	.005	
VT117	12	250	60	.005	Low radiation. Car Radios
VT114	12	300	75	.008	
VT123	12	320	125	.005	
VT113	24	200	50	.005	
VT116	24	250	60	.005	
VT115	24	300	75	.008	
VT119	32	150	25	.005	
VT100	32	200	40	.005	
VT124	32	250	60	.005	

FILAMENT TRANSFORMERS

CODE NO	PRIMARY VOLTS	SEC. VOLTS
PF118	220, 240, 260	2.5V/5A, 2.5V/5A
PF158	220, 240, 260	5V/8A
PF476	240	6.3V/3A
PF138	220, 240	6.3V/4A, 5V/4A, 2.5V/4A, 2.5V/4A
PF162	240	6.3V/3A, 6.3V/3A
PF154	200, 230, 240	7V tap 6V/7A, 6.3V/3A, 5VCT/5A 5V/3A, 2.5V/7A
PF102	240	7.5V/2A
PF111	240	10V/5A
PF211	200, 230, 240	10VCT/10A
PF131	230, 240	10VCT/10A, 5V/15A
PF123	240	15, 12, 8, 6V/1.8A
PF439	240	32V 60W Enclosed one outlet
PF457	240	32V 125W Enclosed two outlets
PF491	240	32V 200 W Enclosed two outlets

BATTERY-CHARGING TRANSFORMERS

CODE NO	PRIMARY VOLTS	SEC. VOLTS
PF265	230, 240	17V tap 11.5, 10, 8.5/4.2A
PF389	230, 240	17, 11.5, 10, 8.5V/4.2A, 17, 11.5V/4.2A 17, 11.5V/4.2A
PF537	240	17V tap 11.5V/0.4A

BELL TRANSFORMERS

CODE NO	PRIMARY VOLTS	SEC. VOLTS
PF648	240	10W Continuous or 2A intermittent.

Fully enclosed including 240V socket and outlet terminals. Designed to operate local and imported chimes as well as various types of bells.

IN ADDITION TO THE ABOVE RANGE, A STANDARD RANGE OF OUTPUT AND MODULATION TRANSFORMERS IS AVAILABLE

ENGINEERED **TODAY** FOR **TOMORROW'S** REQUIREMENTS

Diesel-electric locomotives now used on main line haulage in Australia range from about 1600 to 2000 hp.

Dr. Borst's locomotive would consist of two units, each producing 3500 hp. He estimates the cost of the uranium fuel at no more than £5000 a lb.

The atomic locomotive would cost about £491,000—twice the cost per hp of a diesel-electric locomotive.

Utah University and Babcock and Wilcox Boiler Company are seeking a patent for the locomotive.

Record dive

A French Navy bathyscaphe has made a world record plunge of 13,287ft into the ocean. This is more than two and a half miles.

Two French naval officers, Commanders George Houot and Pierre Willm, made the dive.

The former record of 10,334ft was set in the Mediterranean last year by Professor August Piccard.

The latest dive was made in the Atlantic, well clear of the continental shelf, because the Mediterranean is not deep enough.

The bathyscaphe went to the sea bed in its record plunge. There, the two officers peered for five hours through the bathyscaphe's "eye", through which 1000-watt lamps cast a beam of light.

This was the only light in the surrounding blackness.

The bathyscaphe, which was designed by Professor Piccard, consists of an observation sphere 6ft 6in in diameter, with sides about three and a half inches thick.

Attached to the top of the sphere is a cigar-shaped tank containing petrol.

Heavy iron weights held by electromagnets drag the sphere down and can be released for the ascent.

The petrol in the tank, lighter than the water it displaces, provides buoyancy for the upward journey.

Two propellers allow for limited movement.

Houot and Willm had no line attaching them to the escort ships above.

While at the bottom their observation sphere was subject to a pressure of about 5750 pounds (about 2½ tons) to the square inch.

New AA weapons

A new US naval weapon has a speed three times that of sound, says the technical magazine Aero Digest.

The weapon is known as Sparrow.

The magazine says that Sparrow is slim, eight feet long, and weighs 280lb.

It is fired from aircraft-carrier batteries in salvos to knock down enemy fighters or bombers.

The missile rides a radar beam precisely into the enemy plane, and its terrific speed makes evasion virtually impossible.

Another anti-aircraft missile, known as Terrier, is being installed in guided-missile ships which will be defence vessels for carrier task forces, says Aero Digest.

Terrier, which can knock down the heaviest bomber, weighs more than 1½ tons, travels at twice the speed of sound, and finds its target automatically.

Another anti-aircraft missile, the Hermes, weighs four tons, and can destroy a plane at 100,000ft or higher.

INVERTERS for every PURPOSE

240 VOLT AC 50 CYCLE INVERTERS.

Suitable for loads up to 2 watts. Excellent frequenc stability. Radio interferen suppressed. Operates fro 32 volts home lighting plan Available for use with radi amplifiers, tape recorders synchronous motors. Completely shielded in meta case 5in x 6in x 15in unpacked weight 19lb. Als available 12 volt D.C. to 24 volts A.C. 50 cycle at 25 watt.

MODEL 32099

Price £24-10-0

★

SHAVE IN YOUR CAR!

WITH A CHAMPION DRY SHAVER POWER PACK.

Operates all motor dry shavers. Ideal for cars, caravans, boats etc. Weight 4lb, small size, 4 x 4½ x 2¾ inches
6, 12 or 24 volt.

£8-12-6

DUAL-MODEL

This model was fitted to the Royal Cars and Train in the Royal Tour.

★

PHILISHAVE ONLY!

MIDGET SHAVER POWER PACK

For Philishaves only, very compact unit, draws minimum current from 6 or 12 volt battery; easily fits in glove box etc., Weight 3lb.

MODEL. P. M.

Please add postage on all orders.

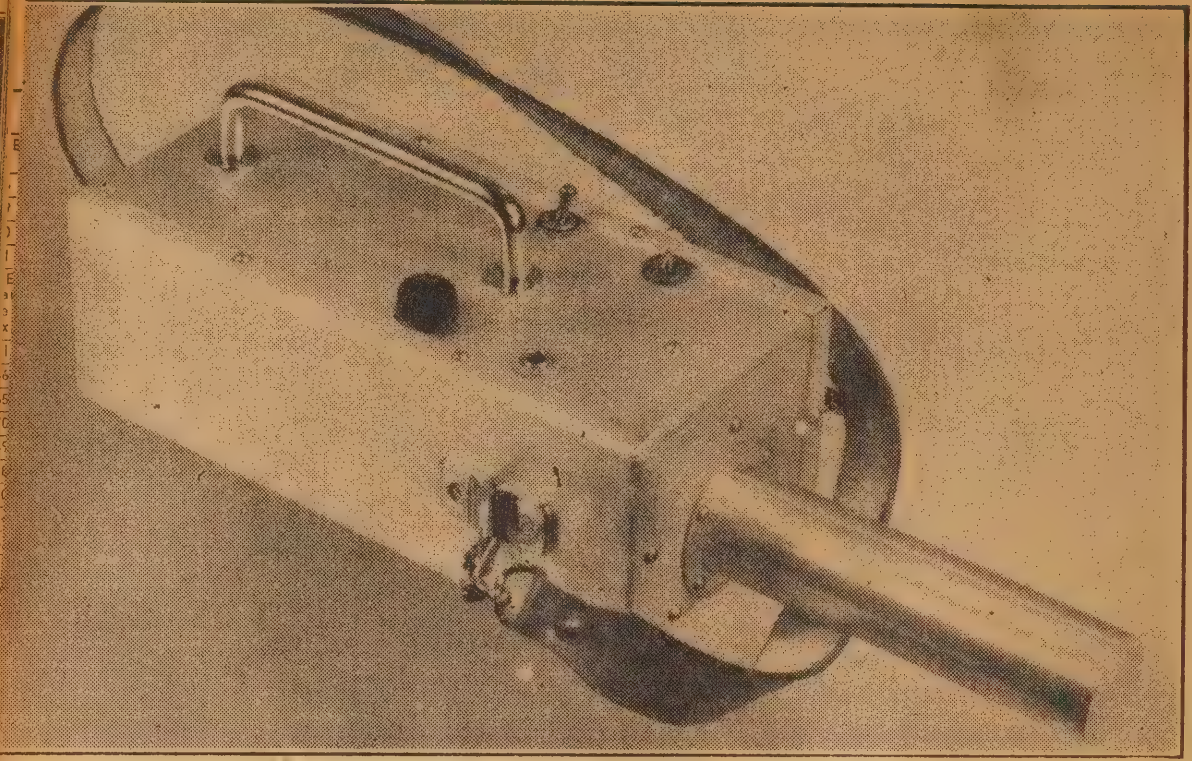
£5-17-11

NOTICE

We wish to advise our Customers that we have acquired manufacturing rights of Inverter equipment from Electronic Communications of West Street, Lewisham, and goods previously advertised by them are available from Glenradio Company. Trade enquiries invited. For further information and supplies contact

GLENRADIO COMPANY

4 RENWICK STREET, LEICHHARDT,
LM4545 SYDNEY. LM4545



This is the self-contained Geiger counter complete with shoulder strap. The off/on switch and the neon "flasher" are on the far side of the top face with the "voltage adjust" control and the phone jack on the near side.

BUILD YOUR OWN G-M COUNTER

In our last issue, we outlined the methods and problems of detecting radioactive minerals. This month we describe a lightweight portable Geiger counter ideally suited for uranium prospecting. An attractive feature is the extremely low battery drain, being 100mA from the A battery and between 1 and 2mA only from the B battery. Audible and visual indication of the count rate is provided.

by Raymond Howe

DURING the month we have been investigating the design problems of a simple Geiger counter, with a view to describing a unit which would not be too expensive, either initially or in its operating costs, and which would present little difficulty in construction to the average reader.

Out of a maze of experimental hook-ups, discarded circuit diagrams and jotted notes emerges a unit which we feel "does the trick". It weighs only a few pounds and can be slung quite comfortably over the shoulder.

VERY CONVENIENT

It is convenient to operate, too. From the slung position, the handle may be grasped by the right hand and the strap slid off the shoulder. As the unit approaches the ground, it can be switched on by the right thumb. When replacing it on the shoulder, the right thumb switches the unit off again till the next time it is wanted.

Although battery replacement will be very infrequent, the process is easy. Simply remove one side of the case and the batteries slide out.

The three 1.5 volt torch cells are mounted in clips on a panel of 1-8in bakelite. The leads to the unit are left sufficiently long to allow the panel to be removed. Batteries and panel are held in place by cardboard packing.

It is difficult to state definitely what life you may expect from the batteries. However, allowing for a period of two hours a day at the current drain mentioned, the B batteries should last for about 400 hours and the A batteries for 60 to 80 hours.

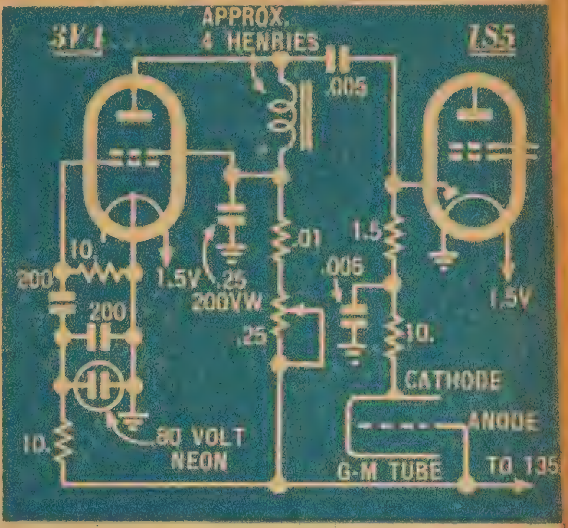
For a period of four hours a day, the expected figure for the B batteries should be around 350 hours. The A battery life would not differ very much from that given for the two hours a day period.

LONGER LIFE

These figures are for continuous running during the periods mentioned. Normally, the Geiger counter would be used intermittently and, as a result, one could expect an increase in the hours of life mentioned. Operating costs can almost be forgotten.

In the introductory article, last month, we discussed various methods of obtaining the supply potential for the Geiger tube.

It has since transpired that high voltage batteries are available locally, but we discarded them as being



This sectional drawing of the circuit diagram is intended to assist readers to understand the electrical operation of the instrument. This particular portion takes in that part of the circuit which provides the EHT voltage for the Geiger tube.

too expensive for our purpose and rather inconvenient, also, where their terminal voltage does not correspond, during service, with the plateau region of the desired G-M tube.

We investigated further the self-generating or "flyback" type of supply, but it soon became apparent that this arrangement introduced problems, the solution of which would involve more time than we were likely to have available.

We thus turned our attentions to the audio oscillator type of supply, using a neon tube sawtooth generator, and to the RF supply. The story on the latter is told elsewhere in this issue.

However, while not suggesting that the RF supply is unsuitable, it is sufficient to say that we found the audio oscillator supply very smooth in operation and capable of providing more than adequate voltage at very low battery drain.

Accordingly, we selected this approach, knowing that our own results could be easily duplicated.

HOW IT WORKS

In the complete Geiger counter, four distinct functions are performed. These are: (1) The production of the power supply driving pulse by the neon tube oscillator; (2) the amplification of this signal and the development of a high voltage pulse across an audio choke by the 3V4 valve; (3) the rectification of this high voltage pulse by the diode of a 1S5 valve; (4) the amplification of the pulse from the Geiger tube by the amplifier section of the same 1S5.

To assist you to understand the operation of the instrument, we have prepared two drawings which break up the complete circuit diagram, one to cover the first three functions and the other to cover the last function.

As explained last month, a relaxation oscillator can consist simply of a resistor, a capacitor and a neon tube. The neon tube is connected across the capacitor and fed from a DC source through the resistor.

The capacitor charges through the resistor until the voltage across it causes the neon tube to strike and discharge the capacitor.

The capacitor voltage falls very rapidly until the neon tube extinguishes, allowing the capacitor to charge again from the DC source until the cycle repeats itself.

The number of times this cycle of events repeats itself each second is dependent upon the values of resistance and capacitance. Within certain limits, the frequency is not critical. The values shown in the circuit diagram result in a frequency of just over 1500 cps.

The type of neon tube most readily available strikes at between 80 and 85 volts. They are often sold in a plastic moulding and may or may not carry a series limiting resistor. They have been sold separately, also for use in photoflash equipment and tape recorders.

HIGHER VOLTAGE

For use in this instrument, we removed a couple of them from their mounting brackets, and wired them directly into circuit, taking good care not to crack the small glass envelope.

Their operating voltage is usually not low enough to strike reliably from a single 90-volt battery, and we thus elected to provide a full 135 volts, made up with two 67.5-volt miniature types. With replacements so rarely necessary, we reckoned this to be of no great consequence.

The voltage appearing across the capacitor has a sawtooth waveform, with the upper limit representing point where the neon tube stri and the lower limit where it tinguishes.

These two points may well be volts apart, which is far in excess the signal normally applied to grid of a 3V4.

Thus it is swung violently i the positive grid-current region, f lowed by another abrupt excurs beyond cut-off.

Without going into detail, the veloped bias in the grid circuit ho the average plate current to a re tively low figure, but the instanta eous plate current swings abrup between the limits of saturation a zero.

In other words, the valve acts li an electronic switch, varying the cu rent through the plate circuit indu tor.

Because of the rapid build-up a collapse of the magnetic field, a hi voltage is developed across the indu tor at each pulse, the amplitude voltage being dependent upon a nu ber of factors, including the value inductance, the shunt capacitanc core losses and, of course, the pea plate current of the tube itself.

VOLTAGE CONTROL

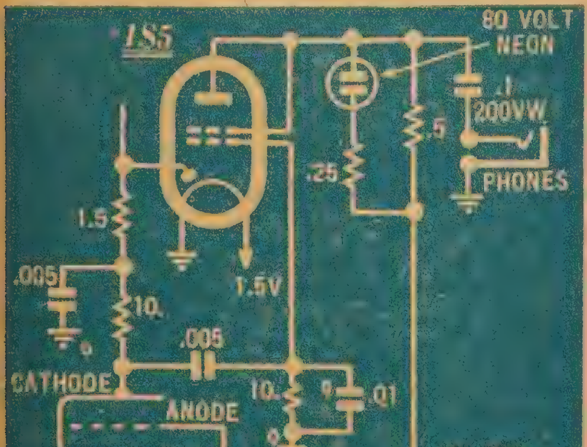
The output voltage can be set the desired level by controlling th plate and screen potential of the 3V with a potentiometer. This allow one to take care of the fall of ba tery voltage with age.

The .01 megohm resistor betwee the potentiometer and the inducto limits the maximum operating volt age of the 3V4 to a safe level if th control happens to be advanced mor than is necessary.

The .25 mfd capacitor places th 3V4 screen and the lower end of th inductor at earth potential for th audio component.

At the low current drain involved there is sufficient emission from one half of the 3V4 filament for satisfactory operation of the circuit. Accordingly, we have shown in the circuit diagram only one section of the filament wired to the A batteries, representing a saving of 50 mA.

The voltage developed across the inductor is fed through a capacitor to the anode of a half-wave rectifier, which, in this case, is contained in the envelope of the 1S5.



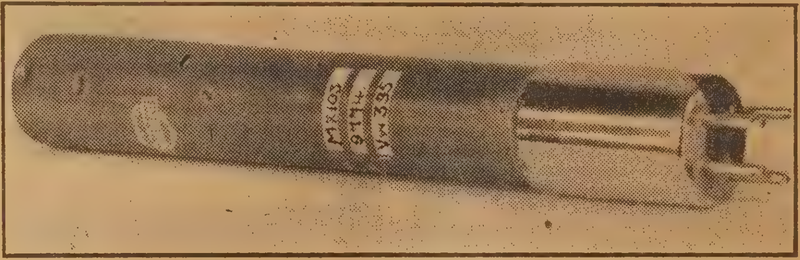
Here is another sectional drawing of the complete circuit diagram. This portion amplifies the counting pulses from the Geiger tube to operate the headphones and the neon "flasher". Note the manner of connection of the Geiger tube, a point which is elaborated in the text.

Mullard

GEIGER COUNTER TUBES

The range of Mullard Geiger Counter Tubes includes types for the detection of Gamma radiation and Alpha and Beta particles and photons down to very low energies. All types are halogen quenched having a long life, and operating over a wide temperature range.

Of special note is the MX103, a low voltage, all metal, self-quenched gamma counter suited for portable radiation detectors and which along with the other types was developed in collaboration with the Atomic Energy Research Establishment, Harwell.



e	Application	Overall Length	Overall Diameter	Threshold Voltage (max) at 20oC	Plateau Length (min.) at 20oC	Plateau Slope %per 100V (average)	Operating Temperature Range	Unshielded Background Counts/ min. (max)	Background Counts/ min. Shielded 2 in Pb $\frac{1}{4}$ in Al	Window Thickness. mg/cm2	Dead Time US approx.
X103	Gamma Counter	195mm	29mm	370V	100V	8%	-55 to + 75°C	110	—	375	130
X108	Beta/Gamma Counter	110mm	26mm	370V	100V	8%	" " "	45	20	10	100
X113	Alpha/Beta Counter	85.7mm	14.2mm	575V	150V	6%	" " "	—	6	1.6 to 2.1	50
X114	Beta Counter	95mm	33.3mm	600V	200V	6%	" " "	—	40	3.5 to 4.0	150
X115	Gamma Counter	110mm	26mm	370V	100V	8%	" " "	45	20	375	100
X118	X-Radiation Counter	168mm	26mm	1140V	200V	5%	" " "	—	50	3.5 to 4.0	150
X122	X-Radiation Counter	168mm	26mm	940V	200V	5%	+10 to + 75°C	—	50	3.5 to 4.0	350

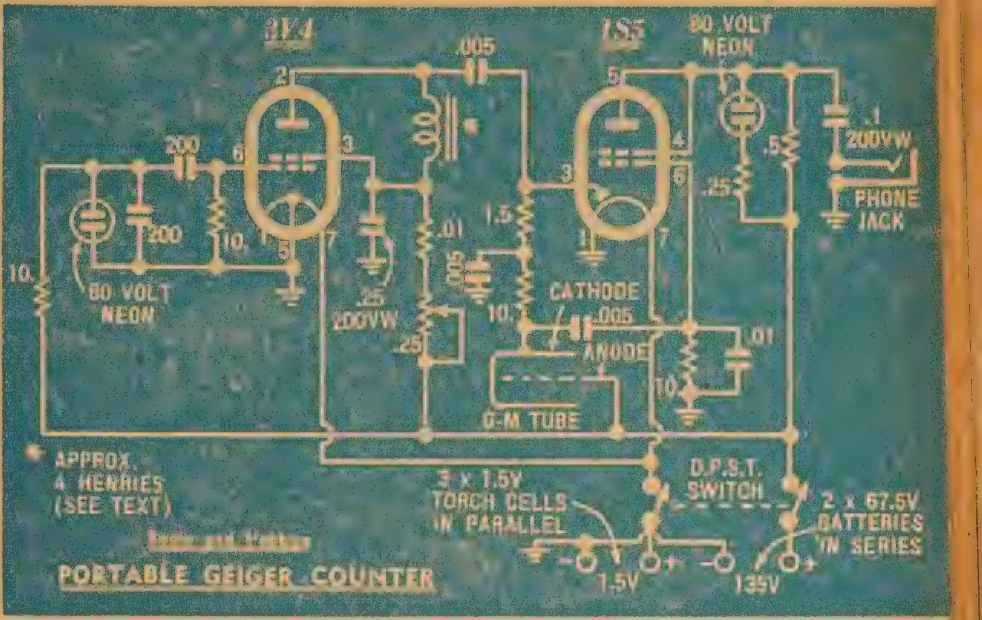
Mullard-Australia Pty. Ltd.

Head Office: 35-43 Clarence Street, Sydney. Tel. BX2006
Branch Office: 592 Bourke Street, Melbourne. Tel. MU2366
Associated with Mullard Ltd., London. Mullard Overseas Ltd.

Mullard

Radio Receiving and Transmitting Valves—Television Picture Tubes—Electronic Photo-flash Tubes—Hearing Aid Valves—X-ray Tubes and Accessories—Geiger Counter Tubes—Cathode Ray Tubes—Photo Cells—Image Converters—Industrial Power Valves and Rectifiers—Thyratrons—Stabilising and Voltage Reference Tubes—Electrometers—Cold Cathode Tubes—Measuring Instruments—Scientific Apparatus—Radio Receivers—Communications Equipment—Ultrasonic Generators—Permanent Magnets, etc.

This complete circuit diagram illustrates the relative simplicity of the device. For reasons given in the text, only one half of the 3V4 filament is used. The value of inductance in the anode circuit of the 3V4 is not critical but should preferably use high quality core material and be of at least 4 to 5 henries. All resistors are of the ½ watt size and the capacitors are of the miniature type.



The type of rectifier circuit used is known as shunt rectification, in that the rectifier shunts the load resistance. While a series arrangement of the rectifier will often give higher voltage output, the shunt arrangement places the filament of the rectifier at earth potential, allowing it to be operated from the same filament battery as the 3V4.

FILTER CIRCUIT

A 1.5 megohm resistor and the second .005 mfd give a measure of filtering, the latter also providing an AC return circuit for the load impedance. The 10 megohm resistor is the load for the Geiger tube and across it the voltage pulses from the Geiger tube appear.

The output from this form of rectifier circuit is negative and requires that the cathode of the Geiger tube (the outside metal sleeve) be below ground potential. We would thus expect the anode, or central wire, of the Geiger tube to be connected to the chassis.

However, by returning it to B plus, we gain a "free" 135 volts, which is just that much less which has to be obtained from the rectifier circuit. In other words, instead of having to develop a full 400 volts, we need only an additional 265 odd volts.

The rectifier arrangement necessitates insulating the outer sleeve of the Geiger tube. In addition, a complementary requirement was that some mechanical shock-proof protection be provided for the Geiger tube. Both objects were achieved by fitting a brass tube shield cover over a rubber wrapping around the Geiger tube. The hole in the front of the case allows plenty of clearance.

All told, this is a very convenient form of power supply for high voltage, very low current applications. By "low current", we mean something in terms of microamperes, as far as these miniature battery valves are concerned. With AC type power valves, the possibilities may well run into a few milliamperes. A
matter of fact, we intend inve
gating this aspect with a view
providing a simple supply for
CRT.

In this present application wh
the drain is but a few mic
amperes, we have been able to p
cure, quite easily, voltages over 1
volts. This might suggest a wi
selection of Geiger tube types.
course, the .005 mfd filter capacit
and 1S5 grid coupling capaci
would have to be rated appropri
to the voltage.

Another point is the permissil
peak voltage stress on miniatu
battery valves. It is obvious th
we could not expect the manufa
turers' blessing on extremely hi
potentials. We feel, however, th
there is little to worry about in t
lower voltage required by the Geig
tube type in this current unit.

PLATE INDUCTORS

In the course of our investig
tions, we found quite a number
commercially - available inducto
which could be used quite satisfa
torily, ranging from the high impec
ance winding of a trigger tran
former used in an electronic fla
unit down to a standard miniatu
filter choke.

As a matter of fact, we delibe
ately arranged for sufficient spac
on the sub-chassis to accommodat
a miniature filter choke. As wi
the choke shown in the photograp
it would be necessary to bend dow
one of the mounting lugs so that
would mount flush with the botto
of the case. This lug is bolted to th
case bottom.

For a given voltage on the 3V4
the EHT voltage output was high
est with the inductor shown in th
photograph. This type has the ad
vantage of a moulded iron cor
material of very high permeabilit
and we anticipate that units will b
available on the market by the tim
this issue appears in print.

Adequate EHT can be obtaine

PARTS LIST

- 1 case 9in x 4in x 3in with press-on side covers and sub-chassis.
- 1 miniature audio choke, 4 henries or higher.
- 1 double-pole, single-throw toggle switch.
- 2 7-pin miniature valve sockets with shields.
- 1 4-pin European valve socket.
- 2 80 volt neon tubes, 1 phone jack and plug.
- 2 67.5 volt miniature B batteries, type 467 or similar.
- 3 1.5 volt torch cells, type 950 or similar.
- 1 pair of high or low impedance headphones (or single earpiece with head-band).

VALVES

1 3V4, 1 1S5, 1 MX103 Geiger counter tube.

CAPACITORS

1 .25 mfd 200VW, 1 .1 mfd 200VW, 1 .01 mfd 600VW, 3 .005 mfd 600VW 2 200pf.

RESISTORS

4 10 meg., 1 1.5 meg., 1 .5 meg., 1 .25 meg. potentiometer, 1 .25 meg., 1 .01 meg. (all resistors ½ watt).

SUNDRIES

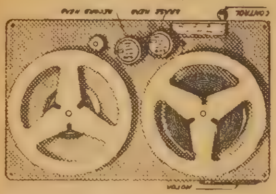
1 4-tag and 1 3-tag mounting strips, 4in x 3in of $\frac{1}{8}$in bakelite for torch cell mounting, 1 knob, 2 rubber grommets, 6in of $1\frac{7}{8}$in o.d. 18g. brass tubing, 18 gauge brass scrap, shoulder strap with attachment fittings, 4 press-on clips for b batteries (2 positive, 2 negative), carrying handle, self-tapping screws for case covers, light gauge spring brass for torch cells clips, piece of inner tube, hook-up wire, spaghetti, solder, solder lugs, nuts and bolts.

Homecrafts PTY. LTD.

LARGEST STOCKS, GREATEST BARGAINS

MAKE YOUR OWN RECORDINGS

L.B. TAPE DECK



- ★ Weight 7½lbs
- ★ High fidelity 50 to 9000 c.p.s.
- ★ One hour playing for each spool
- ★ Self-contained motor
- ★ Electronic erase head fitted
- ★ Built-in vernier control
- ★ Fast forward and re-wind

PRICE COMPLETE £40

Plus 12½% Sales Tax

Above Tape Deck

L.B. Tape Deck, complete with Oscillator, Pre-amp and power supply.

£59/10/-

Or Complete in Carrying Case ready to connect to Radio Set.

£67/10/-

Q PLUS EXTENSION SPEAKERS

57/6

TAPE BARGAIN

3600 foot Reels. Imported Plastic Tape.

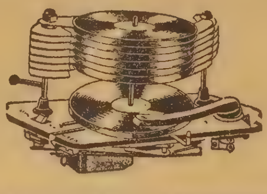
£8/8/-

Complete with 3 empty 7in Spools.

Lumolite

Neon Indicators 9/10

240V AC/DC or 70V for level indicators, etc.



BARGAIN RECORD CHANGER

IMPORTED SWISS "PAILLARD"

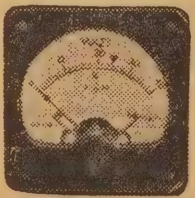
A masterpiece in Record Changers, featuring variable speed, Crystal Pick-up, etc. Brand new.

Paillard Changer £8/19/6

CAPITOL 4-WATT AMPLIFIERS

Suitable for use with Pick-up or Crystal Microphone. High quality reproduction of both Std. and Lp. Records.

£12/10/-



METER BARGAINS

0-20V	14/11
0-40V	14/11
0-2.5 RF amps	7/11
0-3 RF amps	7/11
30-0-30 amps DC	35/-

BAKELITE CABINETS

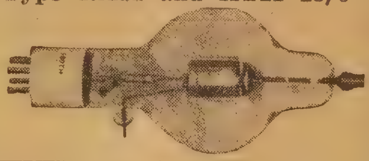
Suitable for Small mantel Radio from 4/11

TRANSMITTING TUBES

Famous Eimac Tubes

Type 35T 39/6

Type RX21 and KY21 28/6



Country Customers Please Add Postage

STOP PRESS BARGAINS

12 volt 500 Watt Generators	79/6
Goldring 150 Pick-ups	39/6
8 Mfd. 525 Volt Electrolytic Cond.	2/6
300 Mfd. 12 volt Electrolytic Cond.	1/6
Crystal Detectors Cup and Arm Type	1/-
Leatherette Portable Cabinets	2/11
Tru-Trac Pick-ups	4/11
Radiogram Cabinet and Record Changer, 3-speed. THE LOT	26gns.

VALVES

6K7 Metal	7/11
6H6 „	7/11
6A6 „	7/11
76 „	7/11
A630 „	2/11
EF50 ”	7/11
6SH7 ”	7/11

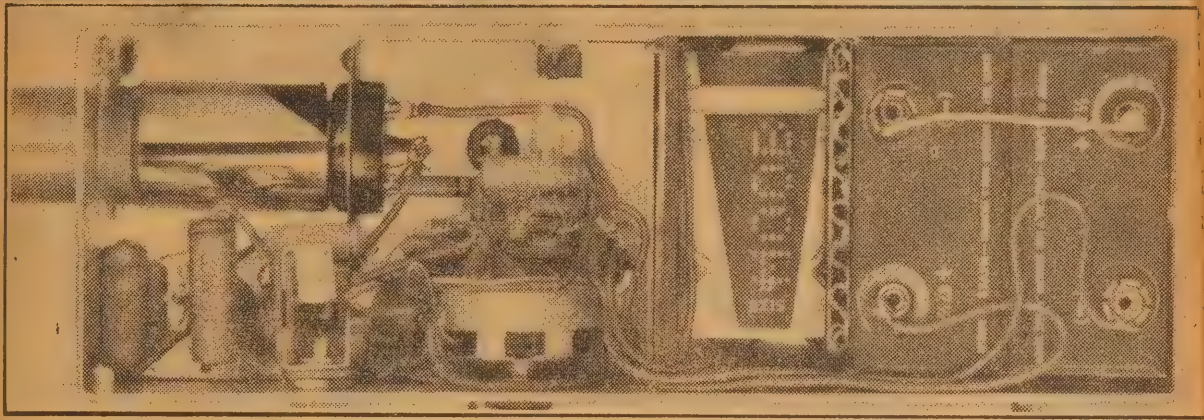
ALUMINIUM RADIO CHASSIS

6in x 4in	5/10
8in x 5in	7/11
10in x 6in	9/4
11in x 8in	11/5
13in x 7in	11/5
13in x 10in	14/-
17in x 8in	17/6
17in x 10in	19/3
17in x 12in	21/6

WRITE OR CALL FOR FREE COLOR RESISTOR CHART

290 LONSDALE STREET, MELBOURNE FB3711

PHOTOS SHOW POSITION OF COMPONENTS IN CAS



The wiring space is limited but by mounting the potentiometer and the phone jack as the last step, the job of wiring is easier than it seems. The .25 mfd capacitor is underneath the potentiometer. Normally, press-on clips are used for the connection to the B batteries.

with less efficient inductors only at the expense of extra battery drain.

So much then for providing the operating voltage for the Geiger tube.

All that remains now is to amplify the pulse developed by the Geiger tube. Incidentally, we refer you to the article in last month's issue for a discussion on what actually makes the Geiger tube "tick".

Consider now the second sectional diagram.

A gamma ray passing through the Geiger tube causes it to conduct momentarily and the developed positive-going pulse appears across the 10 megohm Geiger tube load resistor. It is coupled thence to the grid of the 1S5.

ELIMINATES TONE

The .01 mfd capacitor at the grid bypasses the unwanted audio tone from the relaxation oscillator and prevents it from being heard in the phones.

As the 1S5 feeds normally into a low impedance load (the headphones), it is simply wired as a triode.

To prevent undue AC damping of the Geiger tube load impedance, the grid resistor of the 1S5 is kept high in value. In conjunction with the grid coupling capacitor, it produces grid-leak biasing of the valve and keeps the average plate current down to a very small figure.

The operation of the neon flasher is interesting. The use of a resistive load for the valve would not permit the flasher to operate satisfactorily if wired simply from anode to chassis.

NEON INDICATOR

As an alternative, we wired the neon tube across the [illegible]5 megohm plate load resistor. A pulse from the Geiger tube causes the 1S5 to conduct and act in the form of an electronic switch to place the neon across a voltage approaching the full 135 volts available. The .25 megohm is simply a limiting resistor to protect the neon tube from passing excessive current.

In operation, you will find that the neon will stay alight until the potentiometer is advanced far enough to cause the Geiger tube to operate. The point is that the 1S5 conducts continuously until pulses from the Geiger tube cause sufficient bias to be developed at the grid to cut the 1S5 off in between pulses.

It so happens in this unit that at that setting of the potentiometer where the neon tube starts to "blink" effectively, the total B battery dra is 1.5 mA and the Geiger tu "counts" are heard in the phon at a comfortable level. As a matt of fact, they were still audible wi the phones hanging loosely arour one's neck.

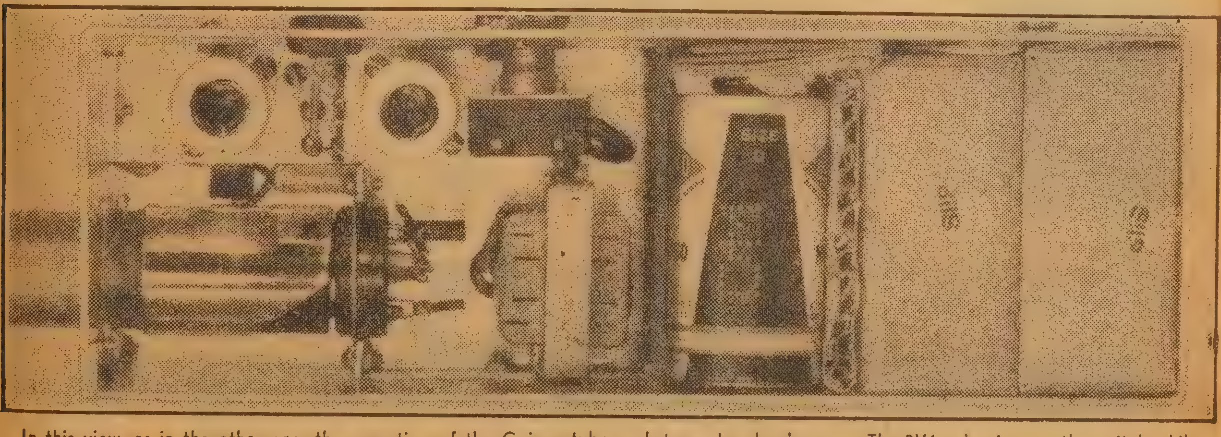
As you can see, the headphon connect from chassis to the 1S5 anoc through a .1 mfd capacitor. Th capacitor prevents any DC voltag from appearing at the phones. Hig or low impedance phones may b used, though the high impedanc type may be more sensitive. Simi larly, you may please yourself whe ther you use a pair of headphone or just one earpiece, attached t single-sided head band.

HEARING AID PHONE

Although we have not tried one a miniature hearing aid earpiece ma be quite satisfactory, in which cas the coupling capacitor need be onl .005 mfd to .01 mfd. On the othe hand, the possible increase in effec tive sensitivity may not be welcome

With these fundamental idea fixed, the next step was to translate it into a practical arrangement of a case and mounting for the components.

Even here there was more than one satisfactory way of going about it



In this view, as in the other one, the mounting of the Geiger tube socket can be clearly seen. The 3V4 valve is near the switch while the neon "flasher" and its .25 megohm resistor are mounted on a 3-tag mounting strip between the valves. Note how the inductor is mounted flush with the case bottom by straightening one of the mounting lugs.

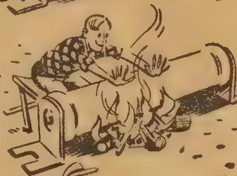
Built to withstand..

OVERLOADS....

Robustly built with ample safety margins thus permitting overloads for short periods without permanent damage to resistor.

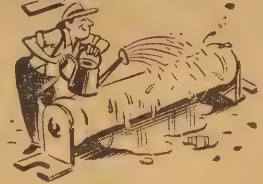
INTENSE HEAT....

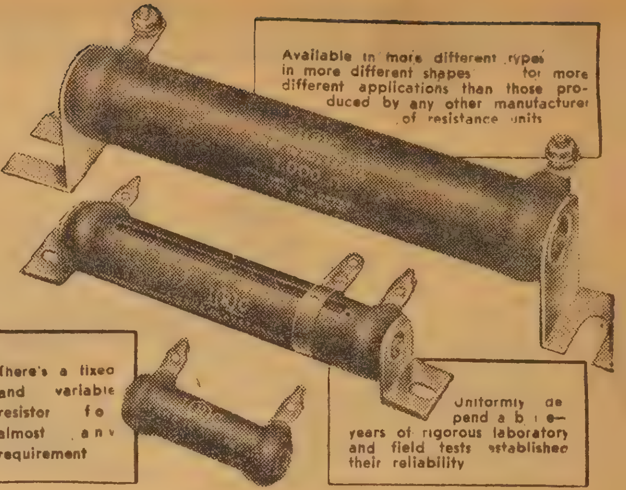
Special IRC Coating gives utmost protection and insures reliable performance in conditions of intense heat. With high temperature coat type resistors the coating is practically infusible.



DAMPNESS....

even salt water immersion . . . makes no difference to dependable performance of IRC Power W.W. Resistors. For special requirements, coatings have been developed to resist the corrosive effects of even boiling salt water.





Available in more different types in more different shapes for more different applications than those produced by any other manufacturer of resistance units

There's a fixed and variable resistor for almost any requirement

Uniformly dependable—years of rigorous laboratory and field tests established their reliability

IRC engineers have now brought these resistors to a high state of perfection and adaptability for practically every power resistor requirement. IRC Power Wire Wound Resistors are unexcelled for long, trouble-free performance even under the most exacting conditions. Write or phone for full details.

IRC AUSTRALIA

Power Wire Wound RESISTORS

Sole Agents for Australia:

Wm. J. McLELLAN & Co. Pty. Ltd.

126 SUSSEX STREET, SYDNEY • BX1131
(50 yards from King St., towards Erskine St.)

FOR PERFECT RECEPTION!

Here are two Aegis developments that will mean clearer broadcast and short-wave reception for you. Your listening pleasures will be remarkably improved.

AF1

AEGIS ALL-WAVE NOISE REDUCING

AERIAL SYSTEM

AND THE AEGIS

MAINS FILTER

MF1

This splendid little line filter eliminates interferences from Lifts, Motors, Refrigerators, etc. coming through the electrical mains.
MF1 retails at 45/-

Completely dispels noise interference in both broadcast and shortwave. Contents: 2 specially matched Aegis Transformer units, incorp. fixed iron-cored B/C & S/W inductances, & Faraday Electrostatic Screen for max. sig. transfer. 50ft. twin plastic-covered low impedance lead-in wire; 40ft. 7/22 copper and aerial wire; egg insulators; complete instructions. All in attractive carton. The aerial is completely assembled—no additional soldered joints. Lead-in & earth wires attached to aerial transformer.

These two products are available from leading retailers in all States.

AF1
Retails at
134/6
complete

Also obtainable AF2
2 Matched Transformers, retailing at
78/- pr.

AEGIS

AEGIS MANUFACTURING CO PTY LTD

208 LITTLE LONSDALE ST., MELBOURNE, C.1. New 'Phone. FB3731

We avoided any fancy construction, which may look nice in a commercial model, and chose a case arrangement which we thought would not be beyond the normally limited metalworking facilities of many readers.

A good deal of thought was given to the physical form which the counter would take, and, in this respect, we had to consider the most likely method of use.

A number of local and overseas designs carry the Geiger tube within the case, others have the tube protruding from the case, while still others sling the unit as a shoulder pack and carry the tube in a probe connected by a flexible cable to the unit.

Out of this group of possible arrangements, we elected to have the tube protruding from the case, with the possibility of being able to use it in a probe on a flexible cable if and when desired. We may have more to say about this next month.

Waterproofing is a problem for the home constructor. It is a strong possibility that one will encounter a heavy downpour while prospecting in the open, and there is every chance that the counter would become "saturated".

On this score, we feel that the easiest solution is to carry in your pocket a loose-fitting elastic-topped plastic bag, which could be slipped over the counter when required. The counter could be used while in the bag, and, if clear plastic material is used, the neon flasher will still be seen.

DETAIL DRAWING

We have prepared a dimensioned drawing giving most of the details to enable you to go right ahead with the preparation of the case and sub-chassis.

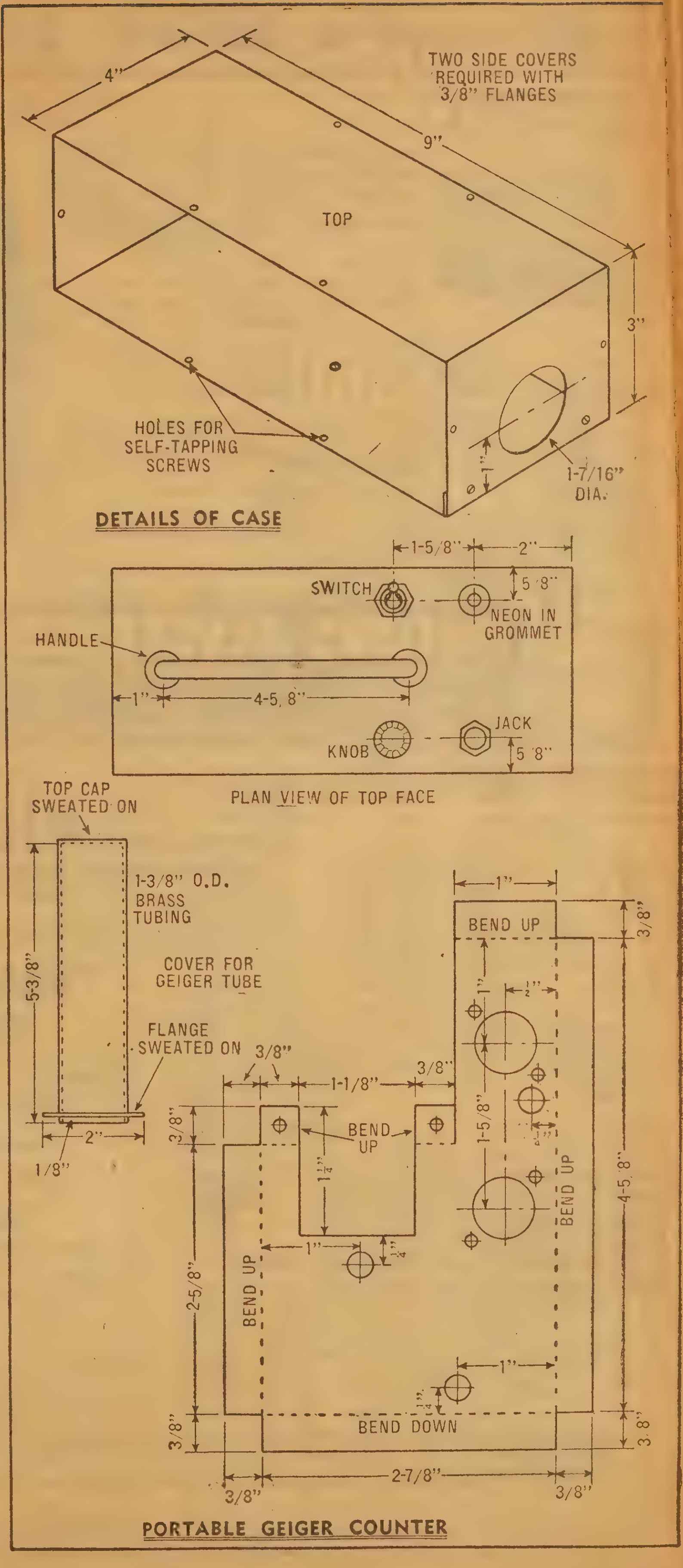
The sliding partition between the battery compartment and the remainder of the unit was, in our case, made up with a piece of 1-8in bakelite. This carries brass spring clips to hold the torch cells. See that the bolts holding the positive clips do not short to the metalwork. You could use countersunk head bolts and cover the recessed head with sealing wax.

The arrangement is best left to individual ingenuity. For instance, another method would be to make the clipping structure a fixture in the case, the cells being slipped into place before the B batteries are replaced.

Though it is possible to solder the leads to the batteries, it is obvious that it does not make for easy replacement in the field. Incidentally, it is not wise to mix new cells with partly discharged ones.

The batteries and sliding partition are held firmly in place with cor-

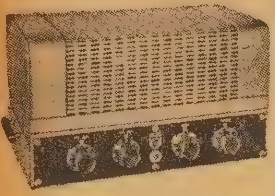
With the aid of these drawings you should be able to produce all of the metalwork for the counter. The sub-chassis is secured at about 2 3/16in in from the left hand edge, the positioning of the securing holes in the ⅜in flange being left to the individual. The Geiger tube socket should be positioned so that its centre lies on the long axis of the case


TWO SIDE COVERS REQUIRED WITH 3/8" FLANGES
4"
9"
TOP
3"
HOLES FOR SELF-TAPPING SCREWS
1"
1-7/16" DIA.
DETAILS OF CASE
1-5/8"
2"
5/8"
SWITCH
NEON IN GROMMET
HANDLE
1"
4-5/8"
KNOB
JACK
5/8"
PLAN VIEW OF TOP FACE
TOP CAP SWEATED ON
5-3/8"
1-3/8" O.D. BRASS TUBING
COVER FOR GEIGER TUBE
FLANGE SWEATED ON
2"
1/8"
1"
BEND UP
3/8"
1"
1/2"
3/8"
1-1/8"
3/8"
BEND UP
3/8"
1-1/2"
1-5/8"
BEND UP
4-5/8"
1"
1/4"
2-5/8"
BEND UP
1"
1/4"
3/8"
BEND DOWN
3/8"
2-7/8"
3/8"
3/8"

PORTABLE GEIGER COUNTER

All ways a SOUND INVESTMENT!

AMPLIFIERS...



Philips' Comprehensive range of reliable Amplifiers includes:—

Item No.	963	3 Watt AC Record Player
" "	957	13Watt 240V AC
" "	974-958	13 Watt 240V AC/6V or12V DC
" "	956	30 Watt AC
" "	961	70 Watt AC

(All suitable for High Fidelity musical appreciation)

TUNER AMPLIFIERS...

The illustration at left is one of the Type 1034, which is an RF Tuner complete with 13 Watt AC Amplifier. Highly suitable for High Fidelity and as P.A. for Hotels, Hospitals, etc. Rack Mounting type Tuners also available. Outstanding features of Philips Amplifiers and Tuner Amplifiers include:

- 100 Volt matching system for output.
- Low internal resistance.

Enquire for leaflet explaining how these Amplifiers are absolutely foolproof in operation. Also, apart from having exclusive safety features incorporated, they employ a system of impedance matching which is simple in the extreme.

Also included in Philips range: Microphones, Stands, Speaker enclosures.

use...

PHILIPS SOUND SYSTEMS

- *Less Service worries*
- *Reliability beyond question*
- *Outstanding performance*
- *Simplicity of operation!*

PHILIPS

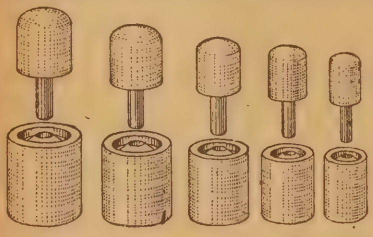
PHILIPS ELECTRICAL INDUSTRIES

SOUND REPRODUCTION DEPARTMENT

BRISBANE, 148 Edward St. SYDNEY, 367 Kent St. MELBOURNE, 590 Bourke St.
ADELAIDE, 119 Grenfell St. PERTH, 381 Murray St.

WILLIAM WILLIS & CO. PTY. LTD.

428 Bourke Street, Melbourne, C1.
Phone MU2426



"WILLIS" CHASSIS PUNCHES

Made especially for the radio man. Guaranteed 10,000 holes if not misused.

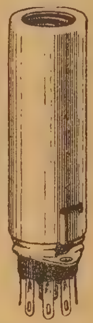
5/8in	19/11
11/16in	21/6
¾in	23/3
1in	29/10
1-3/16in	33/2

Prices Include Sales Tax.

Highest Grade Tool Steel Only Used in the Manufacture of these Punches. Range of Sizes Covers all Valve Socket Diameters.

British Q-Max 1in Square Punch .. 53/11

"TELETRON" VALVE SOCKETS



Arriving Soon!

"WODEN" MODULATION TRANSFORMERS

TYPES UM2-60 WATT AND UM3-125 WATT

Write for details of impedance range

Limited supply only so book your ORDER NOW

Miniature 7-pin Shielded Sockets

Miniature 7-pin shielded valve sockets	Can Size	Type of Valve	Retail (each)
ST47G black electrical grade bakelite with skirt only	—	Complete series	3/1
ST57G/2 black electrical grade bakelite with skirt and shield	1-15/16"	6BA6, 6BE6 etc.	5/2
ST47L natural mica filled bakelite with skirt only	—	Complete series	4/4
ST57L/2 natural mica filled bakelite with skirt and shield	1-15/16"	6BA6, 6BE6 etc.	6/4
ST57G/3 black electrical grade bakelite with skirt and shield	2-3/8"	6AQ5, 6X4 etc.	5/10
ST57L/3 natural mica filled bakelite with skirt and shield	2-3/8"	6AQ5, 6X4 etc.	6/10
Shield can only, -/2	1-15/16"	6BA6, 6BE6 etc.	2/-
Shield can only, -/3	2-3/8"	6AQ5, 6X4 etc.	2/8

Shielded Noval Sockets

Miniature 9-pin shielded valve sockets	Can Size	Type of Valve	Retail (each)
ST47G black electrical grade bakelite with skirt only	—	Complete series	5/3
ST57G/2 black electrical grade bakelite with skirt and shield	2"	12AT7, 12AU7 12AX7, 6AE8, etc.	9/9
ST59G/3 black electrical grade bakelite with skirt and shield	2⅜"	5763, 6T8, Innoval, etc.	9/9
ST49L natural mica filled bakelite with skirt only	—	Complete series	6/-
ST59L/2 natural mica filled bakelite with skirt and shield	2"	12AT7, 12AU7 12AX7, 6AE8, etc.	10/6
ST59L/3 natural mica filled bakelite with skirt and shield	2⅜"	5763, 6T8, Innoval, etc.	10/6
CS92 shield can only	2"	12AT7, 12AU7 12AX7, 6AE8, etc.	4/6
CS93 shield can only	2⅜"	5763, 6T8, Innoval, etc.	4/6

rugated cardboard packing. Glue some cardboard to the inside of the right hand cover toward the rear to prevent shorting of the B battery terminals.

We mounted the sub-chassis in place with only the Geiger tube socket attached. The remainder of the components can still be mounted quite easily. The handle should be fitted at this stage and any excess thread cut off and filed flush with the nut.

A 4-tag mounting strip secured under one of the bolts holding the inductor is sufficient to carry the floating wiring such as for the relaxation oscillator and part of the Geiger tube filter and load. The .0005 mfd capacitor from the 3V4 anode to the 1S5 diode anode should not lie against the case or any other component as the outside foil under the cardboard cover is away from earth potential.

The phone jack and the potentiometer should be mounted when the rest of the wiring is completed. This allows the miniature .25 mfd capacitor to be wired between pin 3 of the 3V4 socket and the earth tag on the mounting strip.

Both the switch and the potentiometer should be mounted with packing washers or an extra nut so that they do not protrude unnecessarily on the top face of the case.

Use component sizes as stated in the parts list and inspect the wiring on completion for correctness and possible shorts due to stray blobs of solder. Use a soldering iron with a small bit and take care with each connection. To be consistent, earth the centre spigot of each valve socket to the chassis.

CARE WITH WIRING

See that you make the correct connections to the switch as an error here could burn out the valve filaments. If you have no multimeter, you can find out which switch lugs should be associated by a continuity test with a torch cell and globe.

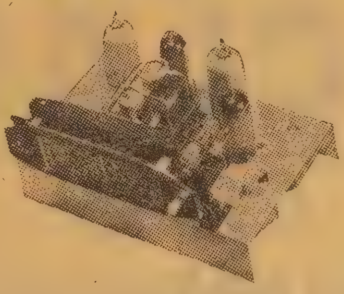
The cover for the Geiger tube is made up with brass tubing 1 3-8in outside diameter. The brass collar is made a neat fit on the tubing, positioned about 1-8in from the bottom and sweated at the underside. To give extra strength here, we ran a 1-8in drill at 45 degrees into the joint at a number of points, taking care not to go through the collar or tubing. When these recesses are filled with solder, greater cohesion is obtained.

The cover is held to the case with self-tapping screws through the collar. A small portion of the collar will need dressing off where it extends below the case.

Ideas will vary on the insulation and shock mounting of the Geiger tube within the cover, but one or two layers of inner tube should be satisfactory.

The Geiger tube itself should be handled carefully. When transporting the counter in a vehicle or aircraft, it is wise to store it vertically to avoid the continued stresses of vibration from fracturing the anode wire support in the Geiger tube.

By the way, operation of the Geiger counter during a thunderstorm could well give you misleading results while investigating an area because the atmospheric electrical discharges can cause spurious counts in the headphones. We hope to have more to say next month about testing and using the instrument.



NEW RELEASE-- RADIO TUNER UNI

This unit is complete with valves (6A
6N8), dial lamp, 4 pin input socket a
plug. It has been wired, tested and align
ready to connect to your amplifier or ta
recorder.
SPECIFICATION—INPUT: 250 Volts 12m
6.3 Volts 0.7 Amps.
OUTPUT: Approx. 0.5 Volts across to
Kohms on local stations. As this tun
has A.V.C. this is maintained for mo
worthwhile broadcasts.

PRICE £12/7/6 16 2-3% S.T

REX the NEW NAME in ELECTRONICS

COIL KIT for R. & H. MODULATED OSCILLATOR
Price 25/- per set & 3/2 S.T.

FLASH LATEST DEVELOPMENT
PULSE INDUCTOR
for GEIGER POWER SUPPLIE
Price 17/9 plus 2/2 S.T.

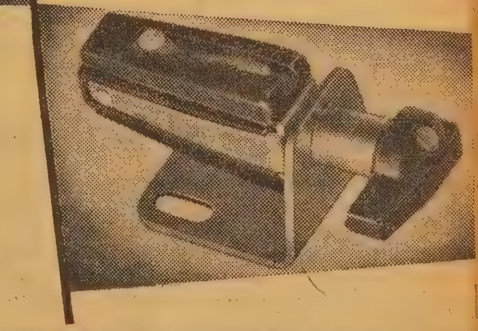
REX Electronics
COMPONENT AND EQUIPMENT MANUFACTURER

LB6674, PO. BOX 4, CARINGBAH, N.S.W.

Contact AWA for your P.A. requirements

'Ronette' GS210 Microphon

Attractively styled high impedance crystal microphone with on-off switch and patented Ronette filtercell cartridge. Available also with inbuilt transformer for use into low impedance lines —200 ohms. Type GS210/L.



'Ronette' Turn-over Pick-up Cartridges

Type TO-284 in models N, P, OV, T and TS with individual replaceable sapphire stylus assemblies for standard and microgroove records answers the demand for a quality cartridge. May be fitted to any American or European tone arm having standard ½" mounting centres. Price, £2. 12. 0.

AMALGAMATED WIRELESS (AUSTRALASIA) LTD
47 YORK STREET, BO233 —— 167 QUEEN STREET, MELBOURNE, MU9161

AVAILABLE IN OTHER STATES FROM
NEWTON McLAREN LTD., ADELAIDE. NOYES BROS. (MELBOURNE) LTD., HOBART. CHANDLERS PTY. LTD., BRISBANE. NICHOLSONS LTD., PERTH.
ALSO FROM LEADING WHOLESALERS.

ANUFACTURERS OF
OMMERCIAL RADIO
ECEIVERS FOR 14
YEARS

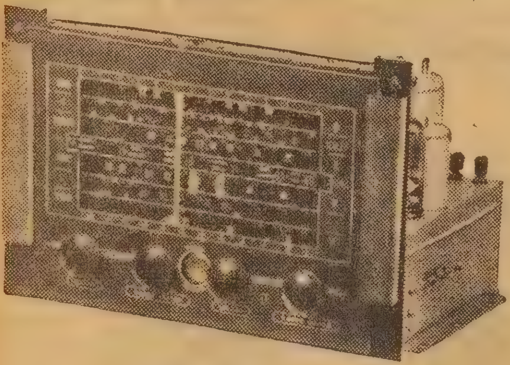
CLASSIC

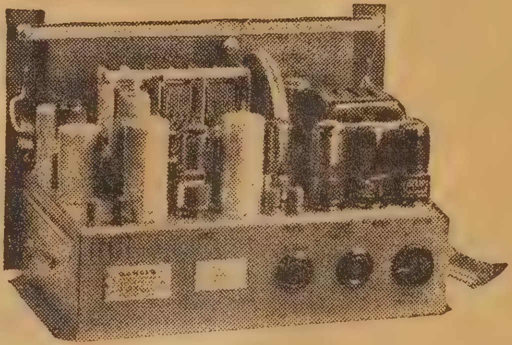
● *World Range* **£33/15/-** *High Fidelity* ●

9-Valve De-Luxe Dual-Wave Radiogram-Chassis

Including Magic-Eye Tuning Indicator With Matched Dual Speakers

FREIGHT EXTRA





COMPARE THESE FEATURES

- Ultra modern circuit with new high gain valves and permatuned iron cored coils and intermediates giving good interstate reception and a short wave range of 12,000 miles.
- High gain audio with push-pull output and tone control gives you high fidelity reproduction from both radio and your favorite recordings. Inverse feedback incorporated.
- Power switch is fitted to the tone control of all chasses thus enabling the power to be completely switched off from the set. Radiogram switch combined with wave change switch.
- Tuning is made simple and positive even on overseas stations by the use of a super sensitive magic eye tuning indicator.
- All chasses are wired for the fitting of an F.M. or Tape Recorder. Special plug on back of chassis being provided, also standard 3-pin socket for power supply to motor.
- Speakers supplied are Magnavox 12in and 8in permanent magnet with tropic proof transformer.
- Large calibrated edge-lit dial in plate glass (11in x 7in) with main stations in each State in prominent type, fitted with counterweight drive and indicator lights on dial showing which band in operation.
- Dial can be supplied in cream or brown with matching knobs and escutcheon to suit blond or walnut cabinet.

All Chassis Carry Six Months' Guarantee

Large range of Radiogram and Console Cabinets from £12

Record Players and Changers

We have a complete range of 3-speed record playing equipment, including B.S.R. or Garrard Players, with turn-over crystal pick-ups or your choice of Garrard, Stromberg-Carlson, Collaro or the new B.S.R. 3-speed changer that will play 7, 10 or 12in records intermixed. All changers have turn-over Crystal pick-ups.

CLASSIC RADIO

245 Parramatta Rd.,
Haberfield, N.S.W.
Phone UA2145

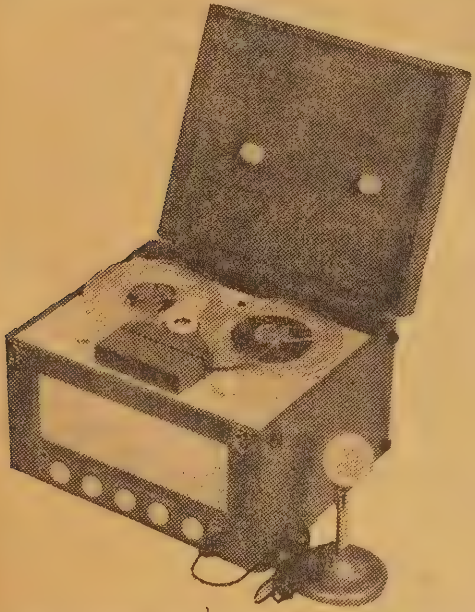
— RADIO

FOR
QUALITY
WITH
ECONOMY

"FERROMASTER" TAPE-DECKS
THE COMPLETE DECK AS USED IN THE "FERROMASTER" TAPE RECORDER

Is now available as a separate unit, supplied complete with high fidelity heads and "Magic-eye" recording level indicator, single knob control ready to plug into amplifier. **£47/10/-**

"FERROMASTER" TAPE RECORDER



The "Ferromaster" tape recorder is supplied complete with crystal microphone and stand, and is fitted in durable, attractive plastic-covered carrying case with space for radio tuner, microphone and tape.

PRICE **£99/10/-**
F.O.R.

A specially designed radio tuner for the "Ferromaster" Recorder is available at £9/15/- extra.

The Only Unit with ALL These Features:–

- TWIN TRACK (GIVING TWO HOURS PLAYING TIME ON ONE TAPE).
- DUAL SPEED (7½ and 3¾in PER SEC). SPEED CAN BE CHANGED BY THE FLICK OF A KNOB WHILE UNIT IS IN OPERATION IF REQUIRED.
- FAST FORWARD.
- FAST REWIND.
- POSITIVE BRAKING.
- THREE MOTORS.
- HIGH FIDELITY AMPLIFIER WITH SEPARATE BASS, TREBLE CONTROLS.
- BUILT-IN OVAL SPEAKER.
- INPUT FOR MICROPHONE, PICK-UP OR RADIO.
- PROVISION FOR EXTENSION SPEAKER.
- RECORDING LEVEL INDICATOR USING "MAGIC EYE".
- TAPE INDICATOR CALIBRATED IN MINUTES.
- FULLY GUARANTEED.

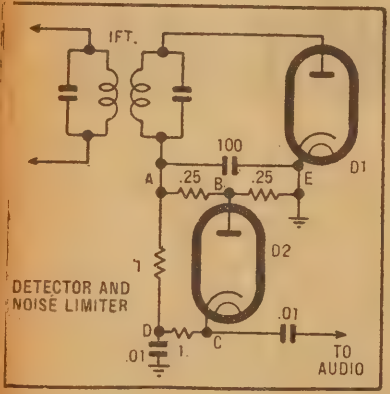
Here's your answer, Tom!

Tom's first question this month concerns the operation of a noise limiter. It's quite a tricky circuit and few explanations that can be understood by other than technical wizards have been published. This is followed by a couple of quick questions on definitions and finally a practical one on power supply calculations.

Here is the first question, just as came to us:—

With regard to the noise-limiter as used in a number of Radio and Hobbies circuits, I have a general idea of the action of the limiter but cannot seem to figure out the details to my satisfaction. Could you please explain its action briefly with the aid of some circuit diagrams?

Thanks, indeed, for bringing the estion to our attention, Tom. Quite number of readers are interested the problem, because it is neces-ry to understand how the limiter orks in order to appreciate its possibilities.



How a noise limiter works

Reviewing again briefly the problem of receiver noise, you may recall that there are two general types. One is the steady noise produced by valves and circuits. As far as ordinary communication circuits are concerned, there is not a great deal you can do about it except to adopt ordinary good design practice by choosing low-noise valves, &c.

In some cases a similar type of noise is radiated by various electrical equipment, but much man-made noise is of the "machine-gun" type, consisting of separate impulses of great strength with periods of silence in between.

A classical example of this is the interference radiated by the ignition system of a car. A high intensity pulse of short duration is radiated every time a cylinder fires. The time between pulses is much greater than the duration of the pulses themselves.

Even so, because of the high intensity of the pulses, the average energy involved is high and a relatively strong signal must be fed into the receiver in order to override the interference.

Electric motors of various types and other electrical devices produce interference of a similar type. Possibly the high intensity pulses are not as well defined as in the case of the car ignition circuit, but the essential point is that the average energy is high only because of the high peaks.

If the peaks can be cut so that their amplitude is only as great as the maximum strength of the signal, the average interference energy passed on to the loudspeaker will be small. This is what is done by the noise-limiter used in many of our communication receivers. The circuit is so arranged that the noise-limiter automatically adjusts itself to cut the interference pulses down to the strength of the incoming carrier.

In practice the idea works very well, and signals which it would be impossible to read otherwise come through with only a trace of interference when the limiter is working correctly.

In order to help you understand the circuit, we have redrawn it here in a slightly different way.

WITH SIGNAL

When an RF carrier is received by the set, the detector diode DI conducts on alternate half-cycles, making A negative with respect to E. AE is a conventional diode load consisting of two .25 meg resistors in series. The potential difference between A and E is proportional to the strength of the carrier.

The 100 pf capacitor in parallel with the diode load offers a low impedance to radio frequencies, but it does not have much effect on audio frequencies. Therefore, if the strength of the carrier varies at an audio rate, the voltage appearing across AE will also vary at an audio rate.

As a matter of fact, the audio signal to be passed on to the audio amplifier is usually picked off from point A.

There is also a negative voltage appearing between the point D and earth, but it cannot vary at an audio rate because of the high value of the resistance between A and D and the presence of the .01 mfd capacitor. Therefore, the voltage between D and earth is simply equal to the average value of the voltage between A and E.

This is where the diode noise limiter (D2) comes in. Looking at the circuit, you will see that it is connected in such a way that the plate is positive with respect to the cathode by half the voltage appearing across the diode load AE.

As long as the instantaneous amplitude of the audio signal across BE does not exceed the average signal across AE (or between D and earth) the diode will conduct and the audio signal will be passed on to the audio amplifier via the coupling capacitor.

NOT TRANSFERRED

However, if a sudden audio pulse appears across BE which is greater in amplitude than the average voltage across AE, the plate of the diode will become negative with respect to the cathode and the pulse will not be transferred to the audio amplifier.

The peak amplitude of a 100 pc modulated carrier is twice the average value, so that the circuit will just accommodate a 100 pc modulated signal without interfering with the modulation. All signals with an instantaneous value greater than twice the average value of the incoming signal or signals are simply chopped off.

Watt's Cookin'?

Some people like to think of the diode as a switch which works automatically to disconnect the audio amplifier from the diode load, but this is less accurate than the idea of slicing off the extreme peaks.

There is no need to worry about peaks in the other direction, because the half-wave rectifier only conducts in one direction in any case.

The time it takes for the voltage at D to change is determined by the values of the resistor between A and D and the capacitor between D and earth. In practice, the values shown have proved a good choice.

The beauty of the idea is that the steady voltage at D automatically adjusts itself to the strength of the incoming carrier.

It does not work well with CW signals, because the steady voltage developed between A and D is proportional to the strength of the signal from the BFO and does not necessarily bear any relationship to the strength of the incoming carrier.

It does not have much effect on continuous noise, either, because the noise affects the average voltage across AE to an appreciable extent. The limiter is most effective at the higher frequencies where atmospheric noise is low and most of the interference is of the man-made variety. However, since there is a certain amount of impulse noise at all frequencies, it will bring about a worthwhile improvement in most receivers.

What is the relationship between the watt and horsepower?

Fairly good, we believe, Tom. Watt was a typical Scot and his horses appreciated him very much. As a matter of fact, they did more work for him than most horses since . . . sorry!

James Watt was an engineer, born at Greenoch, Scotland. He is famous for his early work in the development of steam engines. In those days most of the work was done by horses and Watt was particularly interested in a comparison between the power of a horse and the power of his engines.

Had he lived a few centuries earlier and in a different part of the world, he would have had to sell his engines against slaves, and we would have had the slavepower as a unit!

At any rate, Watt conducted experiments with strong horses and, allowing for friction in his system of pulleys, concluded that a horse could work at the rate of 33,000ft pounds per minute. Unfortunately for the prestige of present-day horses he allowed too much for friction, thus overestimating the work actually done by the horse.

As you know, Tom, power in mechanical form has a direct electrical equivalent, and vice versa. A one horsepower steam engine driving an electric generator can produce the equivalent amount of electrical power. In practice, of course, a little of the power will be lost because the machines are not perfectly efficient.

UNIT OF POWER

For the sake of convenience, it was later decided to establish a unit of electrical power. This amount of power was made equal to that expended when a current of one ampere flows through a potential difference of one volt, and was named the watt in honor of James Watt.

By a transformation of units, it turns out that one horsepower is the equivalent of 746 watts, and this is the figure accepted by most engineering circles nowadays.

Although few horses could actually work at the rate of one horsepower, the unit is none the less useful.

Makes you think, when you come to look at quite ordinary aeroplane engines, of modest dimensions which are capable of delivering 2000 hp and more. Imagine the dimensions of the plane if horses were the only means of motive power!

What is the meaning of KVA?

KVA is an abbreviation of kilo-volt-amperes. If you have a machine which requires 100 volts at 50 amperes, it then requires 5000 volt-amperes or 5 kilo-volt-amperes.

NOT QUITE THE SAME

For DC work it would be easier to talk about kilo-watts, but with AC circuits the current and the voltage are not always in phase, and the actual power is not the simple product of voltage and current.

However, the size of the machine sets the limit in volt-amps rather than watts, and it is more realistic to use the former unit to rate the machine.

If the current and voltage are in the same phase, the KW and K
figures are the same.

If there is a difference in pha
the KW figure is always less th
the KVA figure. The moral is
take steps to see that the volta
and current are in phase so that
machine of a given size is able
do as big a job as possible.

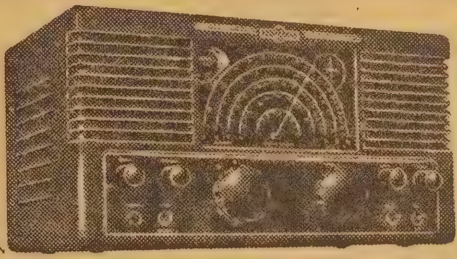
I have a power transformer
which has a 285V winding, a 5V
winding and a 2.5-volt winding.
How can I change this to 150V
high tension and low tension for
6.3-volt valves?

Seems a rather unusual tran
former, Tom, but we will take yo
word for it. In the days when 2.
volt valves were popular, mo
transformers were provided wi
385- rather than 285-volt seco
daries.

Dealing with the low tension ci
cuit first, one possibility is that th
2.5 volt winding has a centre tap
which case you could connect ha
the 2.5 volt winding in series wi
the 5 volt winding to produce 6.
volts, which is quite close enough
the mark for ordinary 6.3 volt valve

Note that the two windings mu
be connected in the same phas
Should they be connected in opposi

(Continued on Page 105)



RADIO Amateurs! NOW AVAILABLE—

THE LATEST EDDYSTONE COMMUNICATION RECEIVERS

MODEL "740" (as illustrated) fulfils the demand for a sensitive receiver having wide coverage and available at a moderate price. Employs eight B8A valves in a straightforward superhet circuit of sound design.

FREQUENCY RANGE
Band 1. 30.6 Mc/s to 10.5 Mc/s.
Band 2. 10.6 Mc/s to 3.7 Mc/s.
Band 3. 3.8 Mc/s to 1.4 Mc/s.
Band 4. 205 metres to 620 metres.

MODEL "840". This model is similar in specification and performance to the "740" but incorporates a built-in speaker and operates from both AC. and DC. supplies—110/240 volt.

MODEL "750". Of double superhet type, this possesses very high selectivity with practically complete freedom from image interference. H.T. supply to the oscillators is stabilised.

FREQUENCY RANGE
Band 1. 32 Mc/s to 12 Mc/s.
Band 2. 12 Mc/s to 4.5 Mc/s.
Band 3. 4.5 Mc/s to 1.7 Mc/s.
Band 4. 1465 Kc/s to 480 Kc/s.

ARRIVING SHORTLY!
"GELOSO" Transmitter V.F.O. Unit
TYPE M 4/101: A very stable five-band three valve V.F.O. unit fully wired and tested.
BANDS: 3.5—4, 7—7.45, 14—14.4, 21—21.6, 28—29.8 Mc/s.
DIAL: Fully calibrated and band spread over 180 degrees.
VALVES: (not supplied) 6J5 Oscillator, 6AUG isolator, 6V6 output.
OUTPUT: Tuned in each band giving at least 3.5 mA grid current to a single 807 on all bands.
POWER SUPPLIES: (not supplied) 400 volt at 32—54 mA.
PRICE £10-4-9
Amateur Net inc. S. Tax.
ORDER NOW — AVAILABLE SOON!

CHANDLERS PTY. LTD.
Head Office & Wholesale Dept., Cnr. ALBERT & CHARLOTTE STREETS, BRISBANE. FA0341
BRANCHES AT CAIRNS, TOWNSVILLE, MACKAY, ROCKHAMPHTON, BUNDABERG, MARYBOROUGH, TOOWOOMBA, WARWICK.

SMALL TRANSISTOR RECEIVERS

Very shortly Australian enthusiasts will be faced with a new era in their hobby—the construction of small regenerative sets using transistors. The design problems they will introduce are outlined very clearly in the following article, which we reproduce from a recent issue of Wireless World.

By B. R. BETTRIDGE, A.M. Brit. I.R.E. (G.E.—Osram)

N interesting method of gaining practical experience of the cirtry employed with transistors, is use them experimentally in radio eivers.

Sets using them, have a value te apart from their novelty or demic interest, because of their remely low power consumption, two possible circuit arrangents are described below giving eful performance with a total cur-t consumption of 6.0mA at 18V. Some elementary consideration of ese circuits and the steps leading to them may be of interest and p to experimenters when they ve an opportunity to try transis-s for themselves.

AIN IMPORTANT

At a stage when transistors tend be scarce and relatively expen-e, it seems appropriate to achieve highest possible gain from the allest number of transistors, even the expense of making the cir-it and its adjustment a little less nple.

This consideration suggests reac-n and reflexing, both common ds to sensitivity in the earlier ys of thermionic valves.

At first it seems somewhat doubt-l whether a transistor with a col-ctor dissipation limit of 100mW uld possibly give sufficient output r loudspeaker operation, but it as found that the volume obtain-le with an input of about 20mW to a sensitive instrument was sur-isingly acceptable and perfectly dequate for following all types of rogram.

Some deliberate restriction of bass sponse by preventing overloading of the output transistor with frequencies making no audible contribution at this low power, was helpful in this respect.

It is also fortunate that quite a high degree of harmonic distortion sounds relatively innocuous at low output levels.

Incidentally, to clear up what seems to be a very common misapprehension, it might be mentioned that at the present moment no junction transistors on the market anywhere appear to have collector dissipations exceeding 150mW and many are limited to 50mW.

Junction transistors with higher dissipation are as yet in the laboratory stage.

The simpler of the two circuits is shown in Fig. 1 and consists of one transistor acting as detector with reaction, transformer coupled to another transistor feeding the loudspeaker. The output stage will be considered first.

Examination of the characteristics of a typical transistor shows that a conservative working point is with collector volts 15 and collector current 5mA, and that a suitable load line is given 4000 ohms.

PROVEN BY TEST

A listening test, using a variable-ratio output transformer, confirmed that this value was suitable and by no means critical, so that slight variations from one transistor to another would be accommodated.

This empirical test of working conditions is easily carried out by feeding in a low-level audio signal from a broadcast receiver and in the absence of more elaborate equipment, it seems well worth while to establish satisfactory operation in this way.

It is suggested that the 5:1 coupling transformer (Multitone Type 100), shown in Fig. 1, should be used for this purpose, its primary being fed through a capacitor from a suitable point, such as the anode of the first audio valve. The feeding in of high level signals or surges must be avoided.

To obtain the correct working-point the transistor requires an emitter bias current of 2mA approx., which is obtained from a 3-volt supply through a suitable resistance.

The HT supply to the collector needs to be only about 10 volts for sufficient output to drive the next stage fully, so this enables decoupling to be incorporated.

The introduction of reaction to improve gain and selectivity is delightfully easy and the trimmer between collector and tuned circuit is all that is required in view of the lack of phase reversal previously mentioned.

This set is sensitive enough to operate at its full volume about 20 miles from a regional transmitter using a small outdoor aerial.

A few remarks on transistor characteristics should be interposed here. Those at present available in this country have a nominal minimum cut-off frequency of about 250 kc/s (this is defined as the frequency at which the current gain has fallen by 3 db). Many operate up to 1 Mc/s, while some function at considerably higher frequencies.

However, bearing in mind this possible limitation, experiments with reaction could well be tried first of all on the lower frequency stations.

EMITTER CURRENT

Another point is that the current gain of a transistor does not reach a satisfactorily high value, nor does its input impedance fall to a satisfactory low value until a certain amount of emitter current is flowing. Thus, a little standing bias may be helpful in bringing the detector to its most sensitive point, and to a point, incidentally, where reaction effects are more readily obtained.

A small amount of resistance in the base circuit will effect this, and a variable resistor of about 500 ohms should be used initially to determine the best value.

The objections to auto bias mentioned previously hardly apply to this case, since the amount required is so small.

Due to the resistance of the germanium crystal itself there is always unavoidable base resistance built into a transistor. This tends to vary somewhat from one specimen to another, hence the need to experiment with the amount to

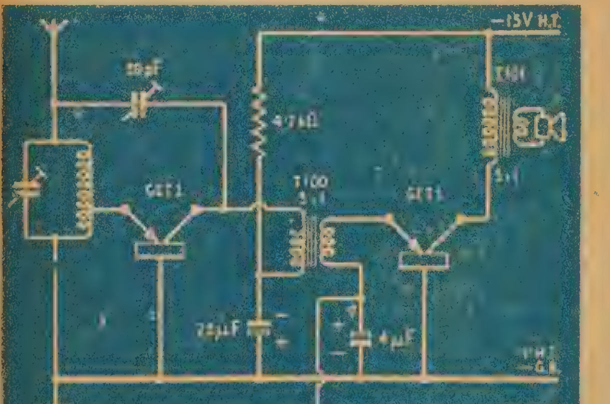


Fig. 1. Simple two-stage transistor receiver with reaction. Note that the high tension line is negative with respect to earth and the bias voltage positive.

USES REFLEX TYPE OF CIRCUIT

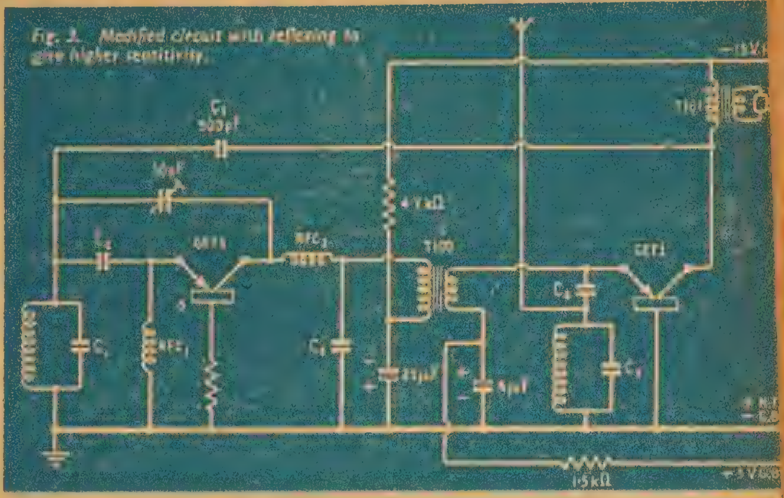


Fig. 3. Modified circuit with reflexing to give higher sensitivity.
C1
C2
C3
C4
C5
C6
RFC1
RFC2
T100
T101
GET1
1.5kΩ

Fig. 3. Modified circuit with reflexing to give higher sensitivity.

be added externally. It will be found that none at all is needed in some cases.

A more complicated circuit, based on the previous one, is shown in Fig. 3. This gives improved selectivity and higher sensitivity so that a "picture rail" aerial is adequate in the majority of cases.

The two main points of difference are the avoidance of tapped inductors for matching, and the achievement of higher sensitivity by means of a reflex circuit.

The method adopted to cover the first point has been described elsewhere and consists of splitting the tuning capacitance into two parts, one being directly across the inductor and the other across the inductor in series with the emitter of the transistor, as C1 and C2 in Fig. 3.

By altering the relative sizes of the two capacitors any proportion of the circulating current can be caused to flow in the emitter circuit, which gives, in effect, an infinitely variable tap, and constitutes an extremely convenient circuit. A DC path for the emitter current must be provided and in the case of an amplifier this can be a resistor.

CHOKE NECESSARY

With a detector, however, a rectified component would be developed across the resistance of such polarity as to cancel partially the audio signal already produced in the collector circuit, and in this case a radio-frequency choke must be used.

In the practical case of the aerial circuit in Fig. 3 an inductor requiring about 900 pf to tune it worked satisfactorily with 750 pf directly across it and the remaining 150 in series with the emitter.

A low L/C ratio circuit was chosen deliberately and among other advantages allows the aerial to be connected directly to its live end, and eliminates the need for a further tap or coupling coil.

The reflex arrangement may require explanation to those not familiar with this type of circuit.

The output transistor is required to amplify first at RF and then at audio, and the aerial circuit is, therefore, coupled into its emitter by the split capacitor technique mentioned above.

The presence of the secondary of the audio transformer is no embarrassment, and it provides the DC path for the necessary bias. Its RF impedance does not have to be particularly high, since that of the circuit at this point is about 200 ohms.

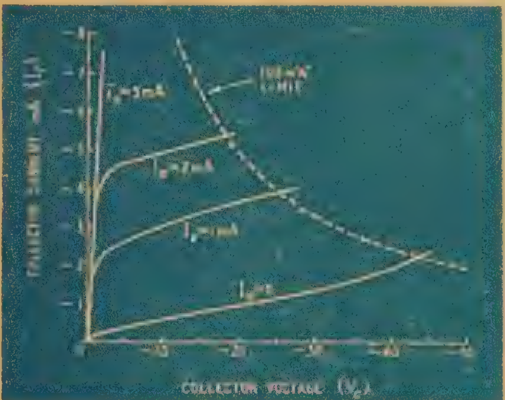


Fig. 2. Static characteristic of type GET1 point-contact transistor. Curves look like valve curves but correlate completely different quantities.

The amplified RF signal appears in the collector circuit, and is developed across the primary of the output transformer, whence it is fed to the detector circuit via C5. By using a low L/C ratio circuit here, damping due to doubtful RF properties of the output transformer primary is not serious.

An RF choke could be included between collector and transformer to place this matter beyond doubt, but was never found to give any advantage with any components actually tried.

The matching to the detector emitter is effected by appropriate choice of C1 and C2 and RFC1 provides the DC path for emitter current.

TO OUTPUT CIRCUIT

The signal then reaches the output transistor for the second time via transformer T100, but only its audio component, the RF component being filtered by RFC2 and C6 to prevent any chance of it being fed back to the aerial circuit and causing instability.

Incidentally, omission of the tuned aerial circuit and connection of the aerial direct to the emitter of the output transistor gives a circuit arrangement the performances of which are midway between those shown in Fig. 1 and Fig. 3 and may be found worth while in certain cases.

Reflex arrangements are notoriously "temperamental", but the only trouble experienced when developing this circuit was a distressing form of overload due to an oscillati being momentarily triggered by lo signals. This was cured by the i corporation of the filter, RFC2 a C6, previously referred to in th detector collector circuit.

Occasional overload on peak which is almost certain to occu when output power is so limited, singularly free from unpleasantnes and the set seems superior in th respect to many receivers using i their output stages small batter pentodes which cannot be said t overload gracefully.

Anyone wishing to follow the author in these experiments shoul take special note of the followin remarks, since transistors are stil expensive and easily damaged.

A meter must be used in the collector circuit to guard against over dissipation, and one in the emitte circuit is very desirable while setting up.

Resistors in emitter or collecto circuits to act as limiters are a reasonable safety precaution in the initial stages, but their presence car upset circuit operation.

LIMITING RESISTOR

In the final circuit the detector has a collector limiter in the form of a decoupling resistance, while the amplifier, although it has no resistance in its collector circuit except the resistance of the output transformer, has the bias resistor in its emitter circuit.

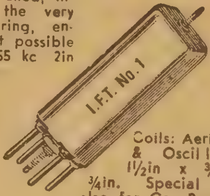
An HT line negative with respect to earth takes some time to get used to, but accidental reversal of polarity can in some cases ruin a transistor and special precautions should be taken to prevent such an accident.

It should be realised that quite a small capacitor can store sufficient energy to fuse the point of a transistor whisker if it is given the opportunity.

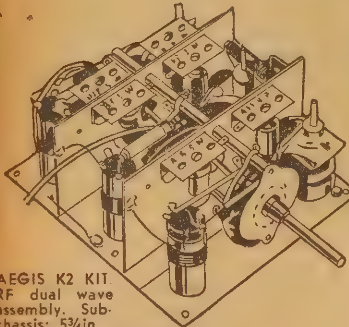
A little common sense will be a safe guide, taking into account that emitter and collector can be

AEGIS COILS, I.F.'s.
AND OTHER COMPONENTS!

IDGEI I.F.'s & COILS ermeability tuned, incorporating the very test iron ring, enring highest possible . I.F.'s: 455 kc 2in S ¾in x ¾in

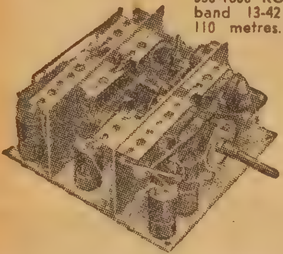


Coils: Aerial, R/F & Oscillator. 1½in x ¾in x ¾in. Special Types also for Car Radios.

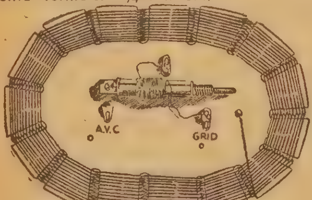


AEGIS K2 KIT. RF dual wave assembly. Sub-chassis: 5¾in long, 2 7/8in high, 5½in wide. All coils permeability tuned.

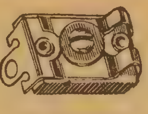
AEGIS K3 KIT. Covers BC band . . 550-1600 KC & SW band 13-42 & 40-110 metres.



AEGIS M17A LOOP AERIAL on oval canvas bakelite formers. 7¼in x 5in.



PACKAGED HARDWARE: cored solder, nuts, & bolts &c.

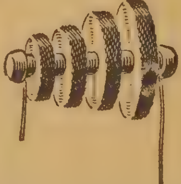


P30 TRIMMERS

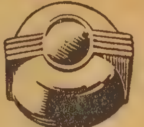
AEGIS Ceramic Insulator. GT2: Feed-through type

AEGIS Ceramic Insulator. S13: Stand-off type

AEGIS Ceramic Insulator. FT1: Feed - through type in 2 sections



AEGIS C3 RF CHOKE. 4 pyes of unequalled turns. Tapered. RF chokes available to any inductance or specification supplied



MV6 Tuning Knob 1in dia. Brass insert Walnut & Ivory.

MV5 Tuning Knob. Walnut, Black, Ivory, Grey, Blue, Green, Red. 7/16in deep

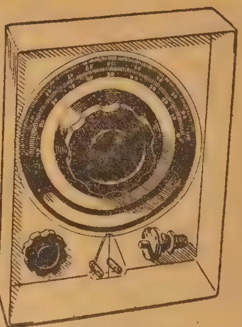
MV3 Tuning Knob. 1 1/8in dia. Black, Walnut, Cream.

MV7 Heavy Duty Pointer. With brass insert. With or without coloured button

MV8 Pointer. Black, Cream, Red, Green.

MV2 Pointer. 1¼in long. ¼in bore. Black, Cream, Red, Green.

MV4 Similar to MV5 only ¾in diam. ¼in bore. Black, Walnut, Ivory, Grey, Blue, Green, Red



R5 AEGIS DIAL. Vernier driven 5in heavy brass plate. Calibrated silver on black, 0-100; 100-0. Suitable modulated oscillator, &c.

DIAL DRUM —bakelite 2in dia.

Dial Drum — bakelite 3in dia.

AEGIS
H/F LACQUER

High Frequency LACQUER. Suitable for impregnating coils (Trolitol) 1½oz bottles

Obtainable from ALL LEADING RETAILERS

AEGIS MANUFACTURING CO. PTY. LTD.

208 LITTLE LONSDALE STREET, MELBOURNE, C.1, VICTORIA. 'PHONE: FB3731

SMALL TRANSISTOR RECEIVERS

(Continued from previous page)

regarded separately as diodes, and a diode will pass very large current when its whisker is made more than about one volt positive; but current is limited to quite a small value when the whisker is made negative provided that this value does not exceed 20 volts or so.

A concealed danger exists in the negative resistance characteristic resulting from a base resistance, since this can cause a trigger effect with very high currents flowing.

More HT voltage than necessary should not be used. Point contact transistors work efficiently from an h.t. supply of 15 volts, so that two 9-volt grid bias batteries in series will supply this in addition to the 3 volts required for the current bias.

Since this receiver is experimental no detailed constructional information will be given, but a few notes about components may be helpful.

Because the receiver itself can be made very small, it seems logical to use the smallest loudspeaker available. It has to be remembered, however, that considerable sacrifice of sensitivity results from decreased speaker size, so that some compromise seems desirable.

The set shown in the photographs uses a 3½in speaker and the volume is sufficient for a quiet room. Substitution of a really sensitive speaker such as the Goodman Axiom 102, enables programs to be followed against considerable ambient noise.

It will be noted that the set in the photograph uses a very convenient technique which has been recently described.

This makes use of the fact that a wire or bolt held in pliers and heated with a soldering iron can be pushed straight into Perspex sheet and is anchored firmly on cooling.

This is very much quicker than drilling a chassis and using anchoring tabs, and it enables a breadboard layout to be used with modern components.

No form of volume control comparable to that using variable-mu valves can be employed, but a variable resistance in the aerial is quite effective.

The circuits shown are not suitable for variable tuning, and if more than one station is required separate tuned circuits should be switched.

The coils used were made by Weymouth Radio Mfg. Company.

CBS Speaker-system

(Continued from Page 21)

cube — so designed that it contains an electric clock.

Sound is radiated from a 6in speaker, which is the same type as used in the "360", through louvres inclined at 45 deg located on the top of the box. The sound is thus deflected against the wall behind the speaker, thereby providing a diffused distribution of the higher frequencies in that area of the room.

The separate speaker of the XD system should preferably be placed in a corner diagonally opposite the player to give most effective results in the average room.

The accompanying curve shows the amplitude characteristic of the "360" with flat signal generator input measured across the speaker terminals without the extension speaker plugged in.

The second curve shows the altered response of the "360" itself with the XD speaker plugged in (dotted curve) and the frequency characteristic of the XD unit itself measured across the speaker (solid curve).

There is an intensity control in the back of the XD speaker which permits balancing of its output with respect to the main instrument.

When the XD speaker is plugged into the "360", the effect on the listener is quite startling. Broadening of the sound source is immediately apparent, even to the point that the positions of the two speakers are detachable only after careful scrutiny.

There is a distinct impression of spatial dispersion which is lacking in conventional single- or dual-speaker sound systems.

ASSOCIATED TRADE JOURNALS COMPANY PTY. LTD.

BOOKS

FOR THE HANDYMAI

Industrial Arts Woodworking "Feirer" 37/
Handwork in Wood "Noyes" .. 42/
Wood Finishing "Jeffrey" 26/
Coloring, Finishing & Painting of Wood "Newell" 63/
Carpentry "Cox" 33/
Essentials of Woodworking "Griffith" 34/
The Art or Woodturning "Klenke" 30/
Chip Carving "Moore" 12/
Creative Crafts in Wood "Dank" 31/
Boats, Airplanes & Kites "La Berge" 26/
Let's Whittle "Pynn" 26/
Fundamentals of Soft Soldering "Yerkow" 23/
Aircraft Mechanics' Handbook "Van Winkle" 29/-
Creative Design in Furniture "Varnum" 41/6

Write for Full Particulars and Prices to The Exclusive Representatives For Australia and New Zealand.

Associated Trade Journals Coy. Pty. Ltd.,
N.Z.L. House, 42 Bridge St., Sydney, N.S.W. Sydney Phone BW1400.

AUSTRALIAN RADIO AMATEUR
CALL BOOK
VK5WI
VK6WI
VK7WI
VK9W
VK3WI
VK2WI
VK4WI
PRICE 4/6
1954 EDITION

ANNOUNCING . . .

The Australian Radio Amateur CALL BOOK

• Available NOW!

• An up-to-date Listing of Station Call Signs and Addresses of Licensees of Amateur Transmitting Stations located in the Commonwealth of Australia and its Mandated Territories.

• Plus up-to-date List of Australian Broadcast Stations and Frequencies.

From all—
Divisions of the W.I.A. and Leading Booksellers in each State
(available in New Zealand through the N.Z.A.R.T.)

★ ★ ★

ORDER YOUR COPY IMMEDIATELY

4/6

(ALL RIGHTS RESERVED)

Postage 6d extra

PUBLISHED BY THE WIRELESS INSTITUTE OF AUSTRALIA

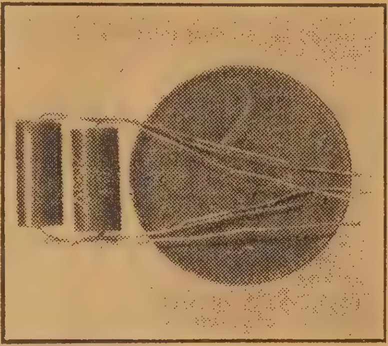
METALLISED PAPER CAPACITORS

Miniature "metallised paper" capacitors have recently appeared on the local market. How do they differ from the familiar tubular types? This article, reproduced in precise form by courtesy of the Aerovox Corporation, details the development, construction and characteristics of these special capacitors.

HE history of metallised paper capacitors has been traced back 1900 when Mansbridge of Eng- ıd was granted a British patent r "capacitors made with paper ated on one or both sides with etal in a finely divided condition."

Mansbridge conceived the first actical approach to the problem England during the middle 1920's hen he developed a paper upon hich was imposed a thin layer of n. The tin coating was first applied "sludge", then dried and cal- ıdered.

This type of capacitor was manu- ıctured both in England and the US for several years, but it did not give satisfactory results and was discontinued. The biggest handcap was non-uniformity of the metal film and weakening of the paper during rolling.



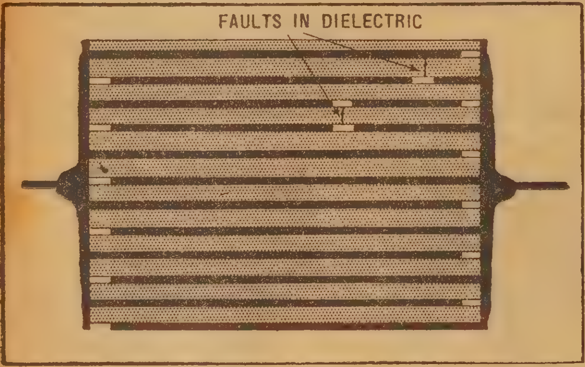


Figure 1 (above): typical locally-made metallised paper capacitors rated at .04 mfd. 200 volt. Figure 2 (left) illustrates the way in which leakage paths through the dielectric are isolated by local melting of the metal film.

One additional fault was that electrical resistance of the Mansbridge coating was high, because of the granular structure and the material itself.

Although the use of Mansbridge paper capacitors was dropped, the basic principles were sound. The main requirement for a successful metallised paper unit is a thin metallic coating of uniform thickness and high conductivity, which can be applied without damage to the paper dielectric.

The development of an evaporation technique of plating metals to a surface under high vacuum offered the first practical solution.

Successful metallised paper capacitors were developed in England and Germany during 1930-40. The English concern, A. H. Hunt, employed aluminium while in Germany, Robert Bosch used zinc. The Bosch process differed from Hunt's in that the paper was lacquered on one side before the application of the metal.

By a very ingenious method, the Bosch people produced margins on the paper by preventing the deposition of the metal on certain areas. These areas were simply coated with an aromatic kerosene, the vapour pressure of the evaporating hydrocarbon preventing deposition.

At the end of the war, the Bosch patents for the manufacture of metallised paper capacitors were made available to all manufacturers as a result of the Alien Property Custodian Act and US Government authorities approved the characteristics of the metallised paper units.

LACQUER COATING

In the manufacturing process, capacitor tissue of the correct thickness is first lacquered with a uniform cellulose acetate coating of thickness between ½ and 1 micron. The coating increases insulation resistance and sparking voltage limits.

After lacquering, the paper is dried, using high temperature and vacuum to remove volatile compounds and water.

The rolls (about 42in wide) are then placed in a metallising chamber, evacuated to a pressure of less than 1 micron of mercury. This is done before the heaters for vaporising the aluminium are started.

The paper is then started and brought to the proper speed for the thickness of metal coating required. The speed of paper past the aluminium source is determined automatically by the resistance of the aluminium film between two insulated rollers.

After metallising, the paper is run over other rollers and a voltage applied across the paper. Shorted portions or weak spots

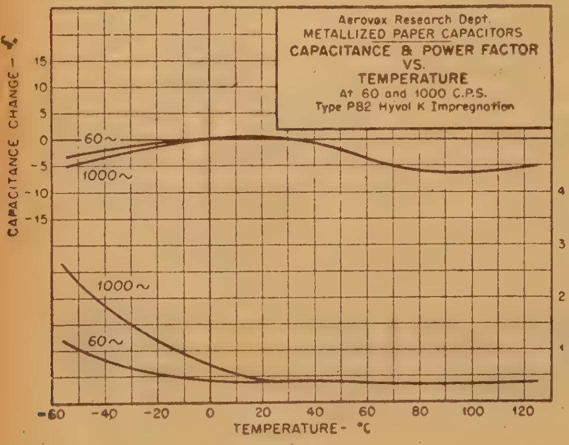


Figure 3: The relationship of power factor and capacitance to frequency and temperature.

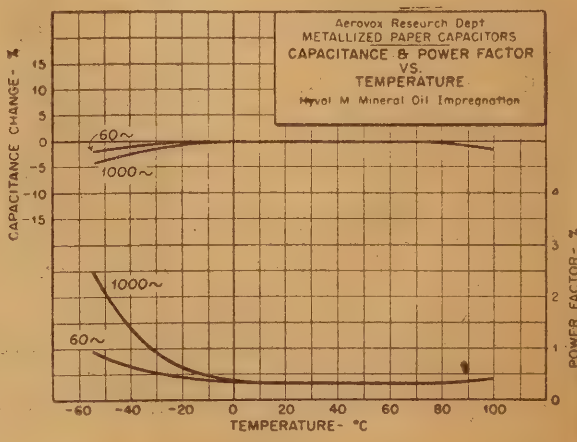


Figure 4: The same relationships as in figure 3 but for a mineral oil impregnated capacitor.

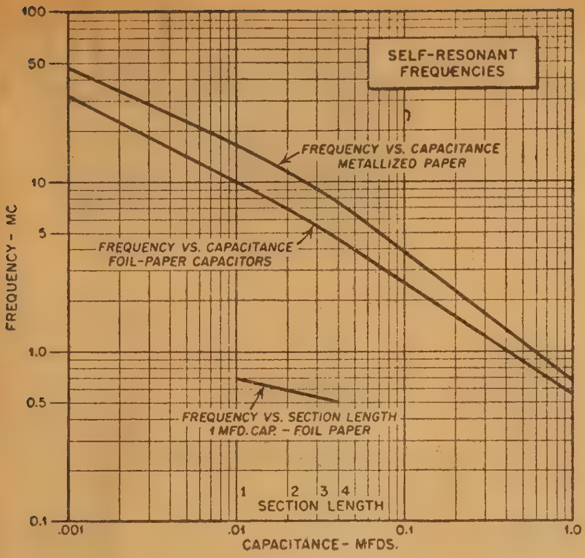


Figure 6: A graph of self-resonant frequency V. capacitance for conventional tubular and metallised paper capacitors.

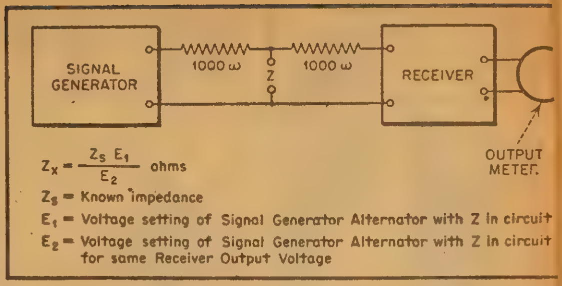

SIGNAL GENERATOR
1000 ω
Z
1000 ω
RECEIVER
OUTPUT METER
$Z_x = \frac{Z_S E_1}{E_2}$ ohms
Z_S = Known impedance
E_1 = Voltage setting of Signal Generator Alternator with Z in circuit
E_2 = Voltage setting of Signal Generator Alternator with Z in circuit for same Receiver Output Voltage

Figure 5: A standard type of impedance test for tubular conden

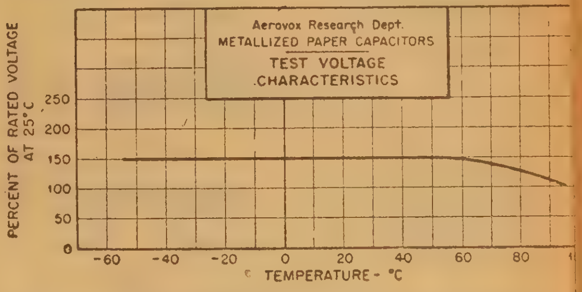


Figure 7: Relationship of test voltage to rated voltage at degrees C. Both test voltage and working voltage diminish shown above 60 degrees.

are cleared in the process, because the current through the defective area melts or vaporises the very thin metal coating away from the hole or blemish in the dielectric.

The next step of slitting and marginating is done in one machine.

Marginating involves the removal of the metal in narrow bands by use of a spark discharge. The bands are twice the width of the margins required and the slitting is done down the centre of the demetallised area.

The rolls of metallised paper are then paired into right and left hand rolls and are used in pairs for winding capacitor sections. Sections are wound on conventional winding machines, with one margin on each side.

After winding, the ends are sprayed with copper, masking (when necessary) a portion of each end to permit good drying and impregnation.

In other respects the assembly of metallised paper capacitors is conventional.

"CLEARING" PROCESS

After the impregnation and final assembly, the capacitors must be cleared. Unlike foil-paper types, a large percentage of metallised paper capacitors come off the assembly line shorted. The resistance of the short may vary from less than 1 ohm to greater than 10,000 ohms. After clearing, the capacitors are given final measurements exactly as the conventional units.

As pointed out earlier, two metals have been used for the manufacture of metallised paper capacitors.

Zinc, having a lower evaporation temperature, permits the use of less complicated equipment than that required for aluminium. As a result, the speed at which the paper may run through the metallising equipment is higher.

Among its disadvantages is the fact that zinc, being a chemically-active metal, must be handled with care, particularly after the paper has been metallised.

In addition,, to reduce the resistance of the film to the required value as well as offset the effects of oxidation, it is necessary to deposit a thicker film on the paper.

Aluminium, although it requires a much higher temperature for evaporation, has certain advantages. The most important is that aluminium is extremely stable after the formation of a thin oxide film, and the finished metallised paper can be stored over long periods without fear of deterioration.

STRONGER LEADS

Aluminium, possessing greater strength than zinc, permits the development of stronger lead connections on the ends of the capacitor.

The impregnants that may be used with metallised paper capacitors are extremely limited because of the effects of any contaminating materials on these thin films. No chlorinated materials which decompose under temperature or electric arc can be used.

This limits the usable impregnants to mineral waxes, oils, silicones and aerolene.

Single paper capacitors are normally impregnated in a microcrystalline wax. Multi-layer capacitors (rated 400 and 600 VDC) may be impregnated in mineral oil wax.

Metallised paper capacitor have characteristics which diffe greatly from those of regula paper capacitors. In fact, th characteristics should be con sidered in most cases withou reference to those of the paper foil type.

The basic difference in the cha acteristics is attributed entirely to t fact that the metal electrodes in t metallised paper capacitors ar e tremely thin, normally being of t order of half a millionth of an in thick.

By virtue of this extremely th metal layer, these capacitors are se healing. This phenomenon depen primarily on the ability of the capa tor to isolate faults within the diele tric layer, thus eliminating the sh circuits normally responsible for t failure of paper-foil capacitors.

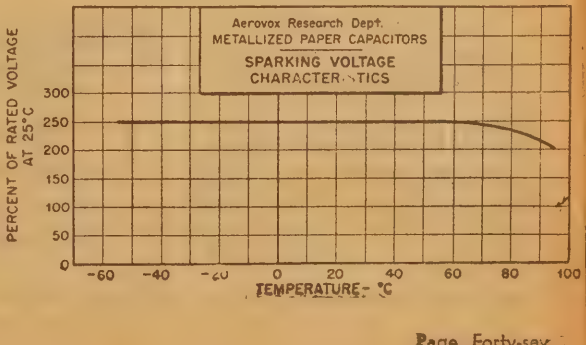
THINNER DIELECTRIC

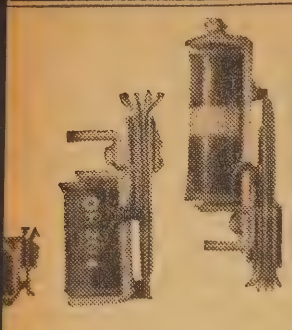
The self-healing characteristic used to advantage in metallised pap capacitors, especially in the lo voltage ratings, by allowing a redu tion of the total thickness of th dielectric and/or decreasing the num ber of multiple layers of dielectri where such are needed.

In the paper-foil type of capacitor

(Continued on Page 53)

Figure 8: The relationship of sparking voltage to rated working voltage at 25 degrees C. Individual flashovers are self-healing but capacitor deteriorates rapidly.





AMERICAN RELAYS

o. 1 Miniature relay 300 ohm oil, S.P.D.T. contacts, 7/6

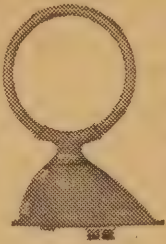
o. 2 Standard relay 250 x 50 ohm coil 4 pole S.T. 7/6

pole S.T. 6/6

o. 3 Standard relay 15,000 hm coil, 2 pole D.T. .. 12/6

All relays suitable for rewinding.

MN26 COMPASS LOOPS



Geared rotatable loop suitable for adapting to light beam rotators, supplied with 30in. flexible drive.

37/6 plus postage

SHOCK MOUNTS. NEW

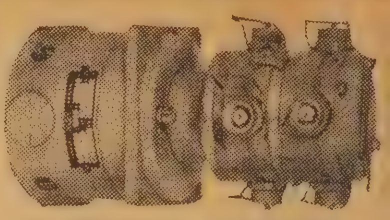
Protect your equipment with these mounts. Set of 4 mounts and rack. 11 ins. by 8 ins.

5/6 plus postage

CONDENSER SPECIAL

American Dubilier oil filled paper condensers. 15 M.F.D. —600 Volt.

12/6 plus postage

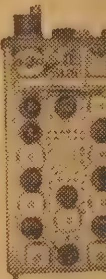


A.C./D.C. MOTORS

Operates on either 24 volts D.C. or volts A.C. R.P.M. 1750, H.P. approx. 1/

29/6, POST FREE

AMERICAN H.F. RECEIVER ASB



Complete with 11 tubes, 7 6AC7, 2 6H6, 2 955 Acorns. Can be altered to 144 or 280 Mc amateur band or FM band.

£6/17/6

Less Valves £4/7/6

PLUS POSTAGE.

HIGH-POWER I.R.C: RHEOSTATS

250 ohm, 25 watt.

10 ohm, 2½ amp; 25 ohm, 1 amp

Price, each 10/6

50-CYCLE A.C. AMMETERS

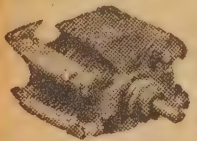
Range 0-14 Amps.
Scale Size 4in. Dia.
Brand New.

Price, each,

45/-

Packing and postage: NSW, 3/-; Interstate, 5/6.

BUTTERFLY CONDENSERS



Capacitance range 3-35 microfarad. Size 1¼ x 2¾ x 2¼ inches. Brass plates: Ultra high frequency insulation: ¼-inch shaft.

Price, each 7/6

Packing and postage: NSW, 1/-; Q., T. and V., 1/6; W.A., N.T., 2/-.

CONDENSER SPECIAL

New Midget Variable Condensers, 19-plate ceramic insulation.

PRICE 5/6

Packing and postage: NSW, 1/-; Q., T. and V., 1/6; WA., NT, 2/-.

D.C. GENERATORS

12v 750 watt. Ideal Home lighting, Battery charging, etc.

PRICE £4/10/- F.O.R.

TRICKLE-CHARGER KITS

Kits for trickle-charger as described in R. & H., June issue. Comprising transformer with 18V winding tapped at 12V-3 100mA rectifiers and 50 ohms control.

Postage: NSW, 5/-; Interstate, 7/6.

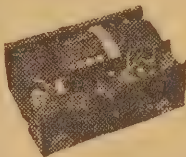
39/6

1143A. TRANSCEIVERS

(English equivalent to SCR 522) Frequency range 100 to 156 m/cs Complete with 20 6.3V Valves. New condition, supplied in transport case.

£12/15/- plus freight

SCR 522 GENEMOTORS



28 volt input D.C., regulated and filtered output filtered D.C. 300 volts at .26 amps; 150 volts at .01 amps; 14.5 volts at 5.0 14.5 volts at 5.0 Completely shielded in metal case, 12 x 8 x 5 inches.

Price, F.O.R. Each 55/-

A.T.5-A.R.8 POWER SUPPLY

24 volt genemotors supply containing two genemotors, one giving 550 volt at 350 mills and the other 250 volt at 100 mills, also contains filter condensers, relays, fuse holders, etc.

£4/10/- F.O.R.

TYPE 1133 TRANSCEIVER

Freq. range 90 to 130 m/cs contains 17 6.3 volt valves with plug

£8/17/6

METROPOLITAN RADIO SUPPLIES

479 Parramatta Road,
Leichhardt, N.S.W:
(at top of Taverner's Hill)
PHONE LM3610

TRANSFORMER SPECIA

H.D. Power Transformer, 265 x 250mA 4v Fil. Windings £2/

H.D. Power Transformer, 365 x 150mA 4v Fil. Windings £2/

C.R.O. Transformer, 1540v, 2v Fi ment Winding £2/

150mA Filter Choke £1/

Prices F.O.R.

NEW MN2 COMPASS CONTROL BOX

37/6

6in Flexible d for above, 1 24in, 18/6.

Postage extr

SPECIALS

Dynamic Mike Inserts .. ..
Carbon Mike Inserts .. ..
Bakelite Fuse Boxes .. ..
5-Position Push Button Switches
Carbon Mike Trans. .. ..
Double Button Carbon Mikes .. ..
Throat Mikes .. ..
Cutler Hammer Switches .. .. ..
Shielded Hook-up Wire, yard ..
3 gang Standard Condenser .. ..
Twin Co-ax Cable, 20ft lengths ..
2 gang Condenser .. ..

NEW WESTON & FERRAN METERS

0-.5 amp. RF thermocouple
0-3 amp. RF thermocouple
0-4 amp. RF thermocouple
0-10mA DC .. ..
0-20 volt DC .. ..
0-5 amp. DC .. ..
0-10 amp. DC .. ..
(All above are 2in flush mo
0-10mA DC English Turner 3in Round Flush Mounting .. ..

Postage Extra.

NEW---AMERICAN TELEPHONE WIRE

›ber insulation with stainless steel and copper conductors supplied on metal ls each containing half-mile of wire. **£1/15/- per reel** :ase lots, each containing six reels (three miles of wire). **£10** **PER CASE F.O.R.**

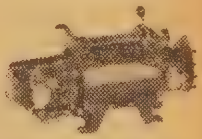
A MOTOR WITH MANY USES

Small 24-volt motor suitable for AC or DC, reversible operation, fully laminated. Approx. one-fifteenth H.P. Size $3\frac{3}{4}$in x $2\frac{1}{2}$in. $\frac{1}{4}$in Spindle. Mounting bracket supplied -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- **39/6**

Transformer suitable for above -- -- -- -- -- -- -- -- -- -- -- -- **30/-**

Postage extra.

HEAVY DUTY GENEMOTOR



ıble for conversion to A.C. motor (approx. one-sixth H.P.). Fully lamin- . Can be used as 6 or 12 volt generator at 20 or 13 amps. **£2/17/6** f.o.r.

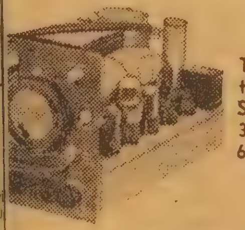
NEW H.F. RECEIVERS AND TRANSMITTER

COMPLETE WITH FOURTEEN 6.3V VALVES AND PLUGS, etc.

IDEAL FOR 144 MEG. BAND

NEW IN CARTON **£4/17/6** **F.O.R. GENUINE BARGAIN**

PHOTOSTAT OF CIRCUIT 7/6 EXTRA



AMERICAN INDICATOR UNIT

These indicators are ideal for conversion to cathode ray oscilloscope having a built-in power supply, the power transformer only needs changing, and there is plenty of room for a time base tube etc. Supplied complete with the following valves:—

3BP1 with full length mu-metal shield, two 6SN7GT, two 6H6, one 2X2, one 6X5 and one 6G6G .. .. Freight extra. **£8/17/6**

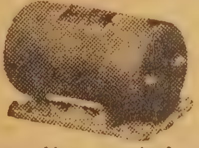
TRANSFORMER TO CONVERT THIS UNIT FOR 240 VOLT OPERATION AVAILABLE AT £3/15/- EXTRA PLUS POSTAGE

---

12 VOLT GENEMOTOR

 12V at 4 amp. Output 220V ?0MA. Suitable car sets, am-rs, etc. -- -- -- -- **£3/15/-**

Postage extra



Input filter supplied with genemotors

28 VOLT GENEMOTOR

Input 28 to 32 volt at 1.5 amp. Output 250V at 100MA. Used but AS NEW -- -- -- -- **£1/15/-**

Postage extra

6-VOLT GENEMOTOR

Input 6 volt. Output 500 volt at 160 MA

£6/10/- F.O.R.

HIGH-VOLTAGE GENEMOTOR

Input 12 volt. Output 1200 volt at 200 MA.

£6/10/- F.O.R

VERNIER DIAL

American velvet vernier dial 100 to 1 calibration. Supplied with ceramic coupling **20/-**

METROPOLITAN RADIO SUPPLIES

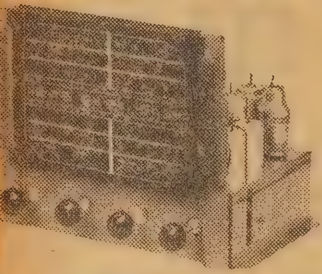
479 Parramatta Road,
Leichhardt, N.S.W:
(At top of Taverner's Hill)
PHONE LM3610

OIL FILLED CONDENSERS

2mfd.	1800V	17/6
4mfd.	200V	4/6
8mfd.	500V	10/-
1mfd.	600V	5/-
.5mfd.	2500V	6/6
.25mfd.	3000V	6/6

Postage extra

200 NEW FIVE VALVE DUAL WAVE RADIOGRAM-CHASSIS



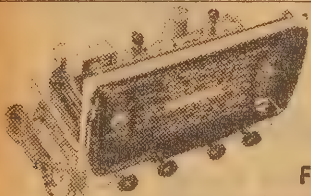
£17/17/6

PACKING and FREIGHT
EXTRA

FULLY GUARANTEED

These chassis give excellent local, interstate and overseas reception, and a fitted with pick-up terminals and radiogram switch. On-off switch is fitte to enable power to be switched off from set.

Supplied tested and complete in every detail with five standard valves, 6J8 6SK7G, 6SQ7G, 6V6G, 6X5G, and 12in Rola or Magnavox speaker.



SMOKE DAMAGED RADIOGRAM CHASSIS, 5 VALVE D/W

These are new five valve dual wave chassis by well known manufacturers and supplied in perf working order but all chassis are badly discolored by smoke. Supplied complete with five new valves (standard types), new 12in Rola speakers and new dial glass and escutcheon. **£11-15-0 F.O.**

FOUR VALVE RADIOGRAM CHASSIS AS ABOVE -- -- -- £10/0/0 F.O.

NEW UNIVERSAL-MULTIMETER

Manufactured by Robinson Electronic Laboratories

Incorporating 4½in world famous American Weston Meter

This high-grade instrument is fitted in a durable and attractive Hammertone-finished case with self-contained batteries and supplied complete with test prods.

D. C. Ranges	A. C. Ranges	D. C. Current Ranges	Resistance Ranges	Output Ranges	PRICE
0-12V	0-12V	0-1.5MA	0-5,000 ohms	0-12V	£12/17/6
0-60V	0-60V	0-12MA	0-50,000 ohms	0-60V	Plus 12/6 PACKING & POSTAGE
0-300V	0-300V	0-60MA	0-500,000 ohms	0-300V	
0-1,200	0-1,200V	0-300MA			

ALSO DECIBEL SCALE-18 to plus 5D.B.

SPECIAL FOR YOUR STANDARD & MICROGROOVE RECORDINGS

NEW ENGLISH B.S.R. THREE-SPEED MOTOR AND TURNTABLE WITH SINGLE LEVER SPEED CHANGE (33, 45 & 78 rpm) AND HIGH FIDELITY TURN OVER CRYSTAL PICK-UP (BALL-BEARING BASE) £6/17/6. POSTAGE EXTRA. INTERSTATE, 8/6; NSW, 5/-.

Synchronous motor and drive in this unit is ideal for tape recorders.

NEW COLLARO SINGLE-SPEED RECORD PLAYERS

Type AC514 single-speed record player with high-fidelity plug-in magnetic head and automatic stop. For 240 Volts AC operation.

Special Price

£2/18/6

PLUS POSTAGE

Interstate 8/6, NSW, 5/-

ALSO AVAILABLE WITH HIGH FIDELITY CRYSTAL PICK-UP, £3/5/-
ROTHERMEL SAPPHIRE NEEDLE PLAYS 2,000 RECORDINGS, 5/6

CRYSTAL PICK-UP CARTRIDGES

Rothermel high fidelity pick-up cartridges, replacement for most pick-ups.

METROPOLITAN RADIO SUPPLIES

479 Parramatta Rd., Leichhardt, N.S.W.
(At top of Taverner's Hill)
PHONE LM3610

NEW — SPEAKERS — AT — HALF — PRICE

8in SPEAKERS

AVY-DUTY PERMAGNETIC WITH
000 OHM C.T. TRANSFORMER **34/-**

6in SPEAKERS

HEAVY-DUTY PERMAGNETIC WITH
15,000 OHM TRANSFORMER **29/-**

OSTAGE AND PACKING

	NSW	Interstate
SPEAKERS	7/6	12/6
SPEAKERS	5/6	9/6
SPEAKERS	5/-	8/6
NSFORMERS	1/6	

12in SPEAKERS

HEAVY-DUTY PERMAGNETIC WITH 5000 OR
10,000 C. T. TRANSFORMER **54/-**

WITH 15,000 OR 20,000 TRANSFORMER 50/-

Separate Transformers to suit any of above speakers—5000 ohm 8/6 each (Supplied with speakers only)

IEW—DYNAMIC—SPEAKERS

w 7in dynamic speaker by leading manufacturer
00 ohm field coil, 7000 ohm transformer — — — **27/6**

w ovaltone dynamic speakers 9in by 6in 1,000 ohm
d and 5000 or 7000 ohm transformer — — — **27/6**

SPECIAL PRICE
FOR QUANTITY
Postage N.S.W. 3/6.
Interstate 5/6

POSTAGE
AS ABOVE

NEW VALVES IN CARTONS
SPECIALS (Ex-Disposals)

17	7/6	6K7G	8/6	6SH7	7/6
	12/6	6U7G	12/6	7193	5/-
7	12/6	6SA7GT	12/6	EF50 with socket	11/6
7	12/6	6SK7GT	12/6	6SH7 or 1K5 in dozen lot.	5/-
7	12/6	6SQ7GT	12/6		
	10/-	3S4	15/-		
	10/-	6C4	15/-	6J8G	17/6
1	9/9	6AG5	15/-	6AC7	12/6
	9/6	1T4	15/-		
G	9/6	VR65A	3/6	955 (acorn)	12/6
G	11/6	5Z3	15/-	957 (acorn)	10/-
	10/6	1K5	7/6	6AK5	15/-

Please add postage

New Electrolytic Condensers

FD-525V **4/6** each or **48/-** dozen plus post
FD-350V **2/6** each or **24/-** dozen plus post
FD-600V **2/6** each or **24/-** dozen plus post
MFD-350V **3/-** each or **30/-** dozen plus post
MFD-40V **2/-** each or **21/-** dozen plus post

New Paper Condensers

0v .. .. 5/6 per dozen
0v .. ..3/9 per dozen
0v .. .. 3/6 per dozen
.02-600v .. .. 4/6 per dozen
.01-500v .. .. 3/9 per dozen
Mixed mica cond. 3/9 dozen

POSTAGE EXTRA

W COILS AND INTERMEDIATE TRANS, By A LEADING MANUFACTURER

natune I.F. trans. 455K.C. — — — **9/6**
Permatune B.C. coils 455K.C. — — **7/6**
Permatune B.C. coils 455K.C. — — **7/6**
Permatune B.C. coils 455K.C. — — **7/6**
Permatune S.W. coils 16-50M. — — **6/6**
Permatune S.W. coils 16-50M. — — **6/6**
Permatune S.W. coils 16-50M. — — **6/6**

ROPOLITAN RADIO SUPPLIES

Parramatta Rd:, Leichhardt, N.S.W:
(At top of Taverner's Hill)

PHONE LM3610

NEW VALVE SOCKETS

Teleton 8-pin octal moulded sockets **5/-** per dozen or **25/-** per 100.

American 8-pin Loctal high insulation **5/-** per dozen or **25/-** per 100.

CARBON RESISTORS

Well known make of carbon resistors in values of 100 ohms to 5 megohms. In 1-watt, ½-watt and 1/3 watt. All resistors are standard color coded and in original cartons. In lots of 100 mixed values comprising 50 1-watt, 25 ½-watt, 25 1/3-watt. .. **12/6**
Post, 1/6.

IN LOTS OF 500, 50/-.

SOLDER

English multi-core solder in 1lb reels.

12/6 per lb.
Postage extra

NEW-SWITCH POTS

Standard - switch potentiometers—½-meg or 1-meg.

6/6
Plus postage

SPECIAL PURCHASE 100 NEW "PAILLARD" RECORD CHANGERS

The "Paillard" record changer has a variable speed motor making it ideal for dance halls, etc., and is fitted with a high fidelity crystal pick-up. Sapphire needle supplied with each unit.
BARGAIN PRICE **£7/18/6**

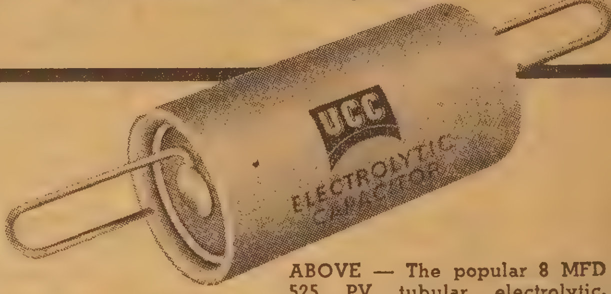
In orginal cartons — freight extra.

NYLEX HOOK-UP WIRE AT HALF PRICE

Nylex hook-up wire 10/.010 in 100 yard coils, each coil consisting of five 20 yard lengths in 5 different colours.

10/- PER 100yds. Plus postage

UCC ELECTROLYTIC CAPACITORS *last longer!*



ABOVE — The popular 8 MFD 525 PV tubular electrolytic, cardboard sleeved, with pigtail connections — shown full size.

CONSIDER THESE ADVANTAGES

Long life • Reliable service • Small size • Wide operating temperature range • Highest quality materials • Closely controlled manufacturing processes • Individually tested and inspected to rigid standards • Ratings 1.5 to 600 PV, 1 MFD to 2000 MFD • Range of mounting styles.

Always specify UCC

Obtainable from all leading Distributors

UCC *Capacitors for every application*

UCC½P.2

FOR FURTHER INFORMATION CONTACT:—

UNITED CAPACITOR CO. PTY. LIMITED • 433 PUNCHBOWL RD., ENFIELD • LF 3511

MELBOURNE: U.C.C. Pty. Limited, 486 Bourke Street.
ADELAIDE: Stephen & Co., 83 Grenfell Street.
BRISBANE: Tecnico Ltd., 103 Albert Street.
PERTH: O. F. Gamble, 384 Murray Street.
N.Z.: H. W. Clarke (N.Z.) Ltd., 42 Cable Street, Wellington.

NEW LOW PRICED TAPE HEAD

MODEL HE2T - a new wide range record - pla
half track tape head produced by L.B. PRODUCT

Interchangeable with model HL2T.
High impedance record-play.
Low impedance bias windings.
Useful frequency range ($7\frac{1}{2}$in per sec.) 50-9,000 c.p.s.
Average output 10 mV.

This head is built to the same high standards as our other heads, and can be recommended for all purposes where the extreme range of model HL2T is not required.

Retail Price List of L.B. Products Tape Heads:—

			£	s	d
Model	HE2T	Record-Play Half Track	£6	3	0
"	HL2T	Record-Play Half Track	8	18	0
"	LIT	Record-Play Half Track Low Impedence	5	7	0
"	EMT	Erase Half Track — —	5	7	0
"	HL2	Record-Play Full Track	8	18	0
"	LI	Record-Play Full Track Low Impedence	5	7	0
"	EM	Erase Full Track — —	5	7	0

Obtainable from Homecrafts Ltd. and Radio and Electrical Stores througho Australia.

L.B. PRODUCTS McDONALD STREET, MORDIALLOC, MELBOURNE

Manufacturers of finest recorder components

SUPPLIERS TO LEADING AUSTRALIAN RECORDER MANUFACTURERS.

METALLISED PAPER CAPACITORS

(Continued from Page 47)

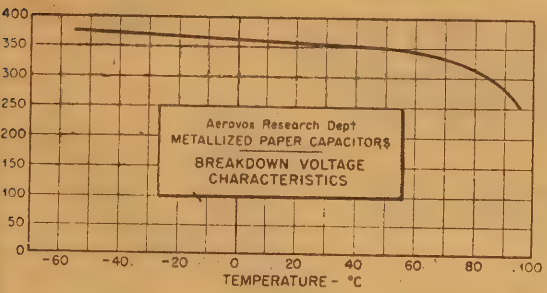


Figure 9: The relationship of breakdown voltage to normal rated voltage at 25 degrees C. Excessive and continuous sparking constitutes a virtual short circuit

:iple-layer insulation is of imance even in low voltage applica-;, because all paper has a certain ber of conducting paths. These be due to metallic particles, holes, thin spots, or conducting ; caused by other materials.

hen multi-layer insulation is l, the possibility of these conduct-paths lining up is small and, efore, a minimum of two sheets aper is generally used.

When metallised paper is used, ese conducting paths are iso-ed in the manufacture of the etallised paper. Conducting ths that may occur later as a ult of dielectric failure in use normally isolated by the ergy in the circuit to which y are connected.

is, of course, pre-supposes that is sufficient energy in the n and at a potential high enough low it to isolate the point of e by melting and possibly ising the metal surrounding it.

asurements of the energy re-l to clear faults have not been satisfactory. Indications are the energy required depends on the resistance of the fault.

majority of faults have a re-ce of less than 1 ohm and the nder are generally under 100

RING CURRENT

lts under 1 ohm will clear with ent of about 10 mA, but an iable length of time may be ed for clearing.

n the clearing current ap-iates 10 mA, the fault is clear-ess than 10 micro-seconds. The required for clearing is de-ed by the resistance of the out most faults will be cleared ut 3 volts.

onsidering metallised paper citors the following char-istics are important: (1) citance, (2) Voltage, (3) in-ion Resistance, (4) Power r, (5) Noise, (6) Life.

capacitance of metallised apacitors is affected by tem-e as shown by the following

e 3 shows the effect of tem-e and frequency on the capa-and power factor of metal-pacitors impregnated in Hyvol eral Wax. These are typical and deviations up to 1 pc expected.

e 4 is a similar curve for a oil impregnated capacitor.

Figure 10: The derating effect of temperature on nominal working voltage. In high temperature zones a 200-volt capacitor diminishes to a 100-volt capacitor.

In RF, as distinct from audio applications, tubular condensers are normally used for bypassing. The significant figures are (1) The condenser's own resonant frequency when shorted and (2) The impedance between the points of connection at frequencies below resonance.

At frequencies above resonance the impedance will normally be inductive and the bypassing action will suffer as a result.

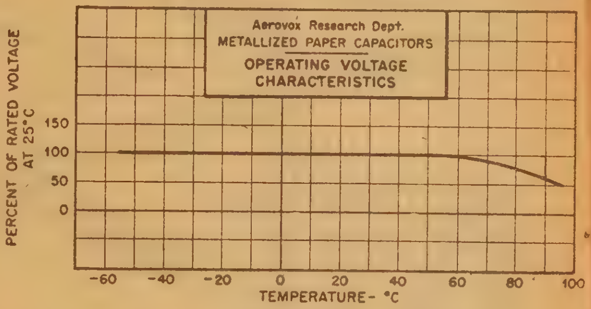
RF measurements are normally made by shorting the capacitors by as short a lead as possible and the use of a grid dip oscillator, as well as by the measurement of the minimum impedance using the circuit shown in Figure 5.

* * *

In Figure 6, the upper curve sho the self resonant frequency of typical line of metallised paper ca citors of various capacitance valu The curve just below, is the cu for comparable tubular capacito The shorter lead length feasible w metallised paper capacitors accou for the higher resonant frequency

The lower curve shows the effe of section length on the resona frequency of a conventionial pap capacitor and indicates the fund mental relationship between c mensions and frequency.

As in the electrolytic capacitor, a new concept of voltage



rating must also be adopted. There is no doubt about voltage (dielectric strength) failure on a conventional foil capacitor, but on self-healing units other criteria must be used.

Thus the voltage rating of metallised paper capacitors is determined by the sparking voltage limit, rather than by life, as in the paper-foil type.

The reason for this is obvious. As long as the metallised paper capacitor will heal, there is no danger of a permanent short circuit. The limiting characteristic is in the ultimate number of sparks or pulses, the minimum insulation resistance, or the maximum power factor of the

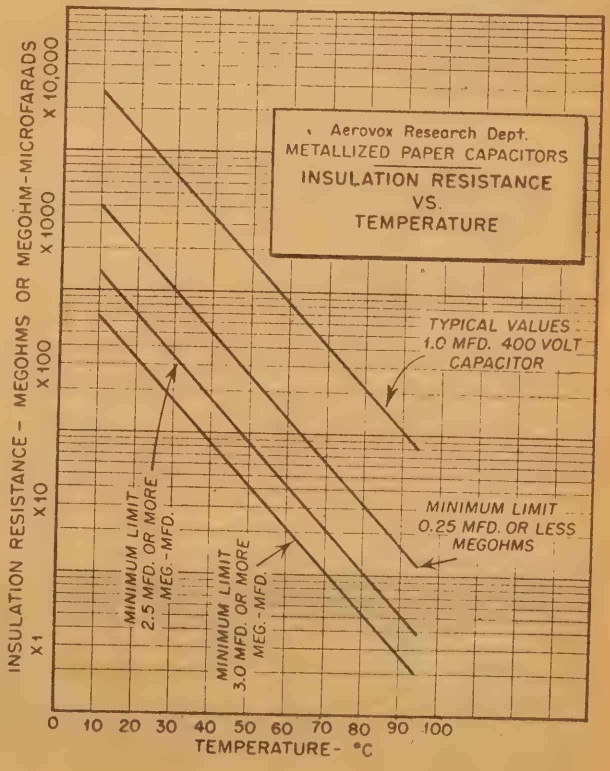
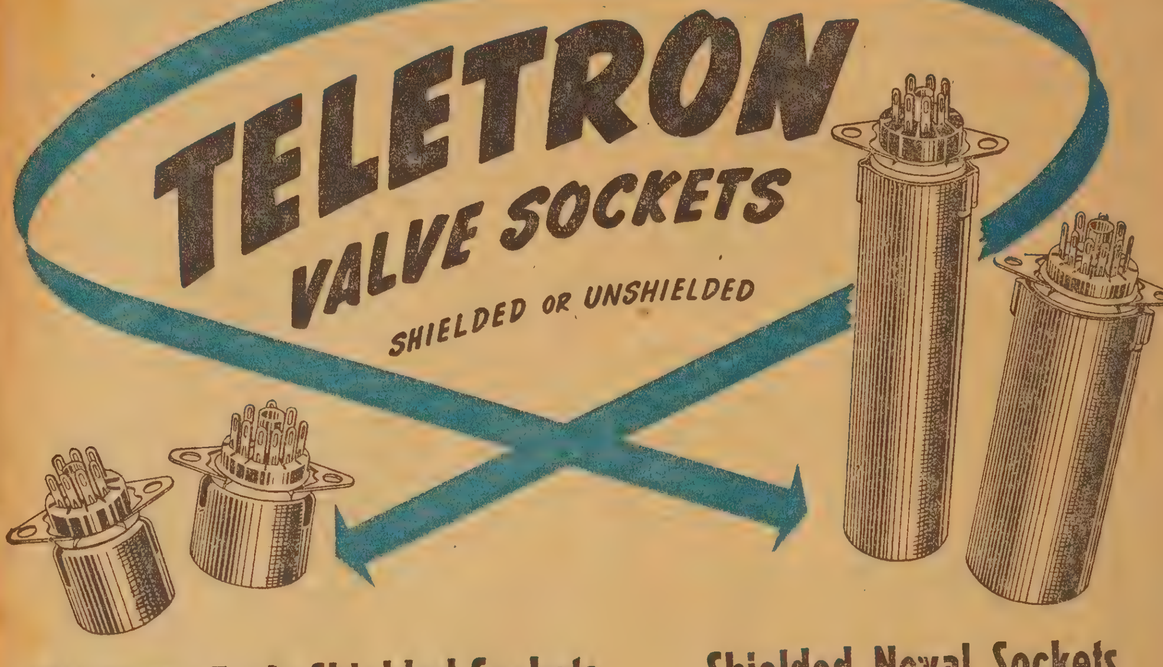


Figure 11: The effect of temperature on insulation resistance for typical values of capacitance. It should be understood that these and the foregoing curves apply in detail only to a single line of overseas capacitors but the general trends and observations will apply to other brands. Manufacturing experience can also be expected to improve overall characteristics and/or make possible further reductions in size.



Miniature 7-pin Shielded Sockets

These sockets are constructed of a moulded body fitted with a metal mounting skirt of 5/8in diameter. The mounting holes of the socket are 1/8in diameter at 7/8in centres. These dimensions are standard and agree with those of the standard unshielded miniature 7-pin sockets types ST 27G and ST 27L.

The shield cans are available in two standard heights, the smaller one, -/2, to suit 6BA6, 6BE6, etc. tubes and the larger model, -/3, to meet the requirements of the larger miniature 7-pin tubes such as 6AQ5, 6X4, etc. Both types of shields are fitted with a conical spring which provides the recommended spring tension on the valve and it is made from tinned spring steel wire, conical in shape, so that the coils do not interlock.

The physical sizes of both the -/2 and -/3 shields conform to Services specifications and the shield itself is made from drawn aluminium alloy with a hole at the top to provide adequate ventilation and ensures complete protection of the sealing-tip of the valve. The bayonet design provides positive locking and neat fit to ensure continuity of shielding with skirt.

The skirt on to which the external thread fits is of brass cadmium plated with a prior flashing of tin to prevent absorption of cadmium by brass and the sockets can be supplied with skirts less shields if required. This will cater for those requirements where only partial shielding is necessary.

Miniature 7-pin shielded valve sockets	Can Size	Type of Valve	Retail (each)
ST47G black electrical grade bakelite with skirt only	—	Complete series	3/1
ST57G/2 black electrical grade bakelite with skirt and shield	1-15/16"	6BA6, 6BE6 etc.	5/2
ST47L natural mica filled bakelite with skirt only	—	Complete series	4/4
ST57L/2 natural mica filled bakelite with skirt and shield	1-15/16"	6BA6, 6BE6 etc.	6/4
ST57G/3 black electrical grade bakelite with skirt and shield	2-3/8"	6AQ5, 6X4 etc.	5/10
ST57L/3 natural mica filled bakelite with skirt and shield	2-3/8"	6AQ5, 6X4 etc.	6/10
Shield can only, -/2	1-15/16"	6BA6, 6BE6 etc.	2/-
Shield can only, -/3	2-3/8"	6AQ5, 6X4 etc.	2/8

Australian & Overseas Agents.

**Wm. J. McLELLAN & Co.
Pty. Ltd.**

126 SUSSEX STREET, SYDNEY, B.X1131
(50 yards north of King Street)
DISTRIBUTORS IN ALL STATES

Shielded Noval Sockets

These sockets are constructed of a moulded phenolic bod
with a metal mounting skirt, the dimensions being ¾in diamete
mounting hole, 1/8in diameter fastening holes on 1-1/8in mount
ing centres. These dimensions are standard with RCS.1000 an
agree with those of the unshielded ST19 noval sockets. The shiel
cans are of two standard heights and fitted with a conica
spring to provide the correct retaining force for all the type
of noval valves commonly used.

The ST49G and ST59G types incorporate a high quali
electrical grade wood-flour filled phenolic moulded body (blac
suitable for general purpose use in the B.C. and S.W. range

The ST49L and ST59L types are moulded from mica-fille
phenolic (natural) and are suitable for use in the VHF ran
and other miscellaneous applications and also where low moistu
absorption properties are of importance.

CONTACTS are standard miniature type, spring temper
to provide low contact resistance. They are silver plated
provide ease of soldering and are readily held in position by
retaining barb. However sufficient float is provided to avo
straining of metal-to-glass valve base seals.

THE CENTRE SHIELD is of generous proportions to per
adequate shielding between contacts and is tin plated. T
EXTERNAL SHIELD CAN provides sufficient shielding of
valve from external circuits and extraneous fields. It is ma
from drawn aluminium alloy with a hole at the top to provi
adequate ventilation, and the height allows full protection
the valve sealing tip. The external shield cans are available
two sizes:

-/2 — 2in high, designed to accommodate valve ty
12AT7, 12AU7, 12AX7, 6AE8, etc.,
-/3 — 2⅜in high, designed to accommodate valve ty
5673, 6T8 and the Innoval series, etc.

The bayonet design of the external shields provides posi
locking and close fit which ensures continuity of shielding
the skirt.

Miniature 9-pin shielded valve sockets	Can Size	Type of Valve	Reta (eac
ST49G black electrical grade bakelite with skirt only	—	Complete series	5/
ST59G/2 black electrical grade bakelite with skirt and shield	2"	12AT7, 12AU7, 12AX7, 6AE8, etc.	9/
ST59G/3 black electrical grade bakelite with skirt and shield	2⅜"	5763, 6T8, Innoval, etc.	9/
ST49L natural mica filled bakelite with skirt only	—	Complete series	6
ST59L/2 natural mica filled bakelite with skirt and shield	2"	12AT7, 12AU7, 12AX7, 6AE8, etc.	10
ST59L/3 natural mica filled bakelite with skirt and shield	2⅜"	5763, 6T8, Innoval, etc.	1
CS92 shield can only	2"	12AT7, 12AU7, 12AX7, 6AE8, etc.	4
CS93 shield can only	2⅜"	5763, 6T8, Innoval, etc.	4

THE SKIRT is manufactured from brass, is cadmi
plated with a prior flashing of tin to prevent absorpt
of the cadmium by the brass. Sockets can be suppl
with skirts only where partial shielding is necessary

Springs incorporated in the shields provide rec
mended spring pressure on the valve and are construc
from tinned spring steel wire. They are conical in sh
to obviate any risk of coils interlocking.

r that the circuit will toler-

ese, the sparking voltage be-
the most important single
ning factor. Considering
erms, the following explana-
ply:

RATED VOLTAGE: Capaci-
rated at or below rated volt-
within the temperature range
impregnant will seldom, if
ort circuit. As a result, in-
resistance will not decrease
erating if the capacitor case
tically sealed.

dom short circuits do occur
citor will heal with very little
if any) in the characteristics,
g the applications are cor-
the capacitor is not her-
sealed the characteristics
end on the efficacy of the

NG FACTOR

erating voltage is the rated
temperatures of 50 degrees
ow. For operation at tem-
above 50 degrees C the
voltage will be less than
voltage by a derating factor,
sed later.

eration of metallised paper
s is possible and satisfac-
vided the proper ratings are
The maximum 60 cps
or units rated at 200 VDC
s RMS and 250 volts RMS
rated at 400 VDC.

EST VOLTAGE.—Figure 7:
voltage of the capacitor is
a voltage 50 pc higher than
voltage.

pose is to check for faults
not be cleared, an undue
of partial failures or the
to produce fluctuation in
alues.

oltage also is based on a
rating.

SPARKING VOLTAGE. —
This is a voltage level at
arking of an intermittent
ll occur generally of one or
ks per hour. Under this type
on, the insulation resistance
pacitor is lowered, making
fe condition.

ONAL SURGES

its where the limiting re-
low; and with considerable
pabilities, the shorts may
plete failure if allowed to
or extended periods. How-
some applications, surge
eaching into the sparking
nge may be used safely,
the system is immune to
cal noises or pulses set up
arking.

REAKDOWN VOLTAGE.—
As the voltage across a
paper capacitor is in-
value of voltage will be
which continuous spark-
ccur. The capacitor, is to
short circuited.

ed paper capacitors must
d at voltages lower than
d voltage if the ambient
deg C. The derating curve
ised paper capacitors is
steeper and the allowable
voltage drops off more
an the conventional type
r.

wer factor of metallised
acitors at low frequencies
,000 cycles per second) is
that of mineral wax or
mineral oil impregnated capacitors.

Generally speaking, slightly lower RF power factors may be obtained with metallised paper capacitors as against conventional foil capacitors at the higher frequencies. (See again fig. 6).

The insulation resistance of a metallised paper capacitor is generally lower than that of a paper foil capacitor, particularly for capacitors with single paper dielectric.

With the use of a single paper a larger number of conducting paths are present. When these conducting paths are cleared a certain amount of the impregnating material in the vicinity of the conducting path becomes over-heated, deteriorating and lowering the insulation resistance.

The effect of a single cleared spot can generally be neglected, but when a multiplicity of these spots occur, the insulation resistance will show a marked decrease.

It is difficult to predict ultimate figures of insulation resistance, since it depends on many and varied factors. It also decreases as the operating temperature rises and normal procedure is to quote and maintain figures of insulation resistance for likely operating temperatures in service.

There has been considerable thought given to the noise characteristics of metallised paper capacitors. In practice, however, it has not proved to be a problem in either audio, RF or pulse applications. Temperature cycling tests and high temperature "potting" of the components have not revealed any weaknesses in this direction.

MICRO-MINIATURES

Capacitor life, as indicated by a damaging change in characteristics, has proved to be quite satisfactory.

A special adaptation of the metallised paper technique has been evolved to produce so-called "micro-miniature" tubular condensers.

Instead of using two coated papers, with margins, as in the normal fashion, these condensers use only a single paper. Because of this and the elimination of the usual margins, the capacitors can be wound to very small dimensions on relatively simple machines.

The paper is first metallised in the normal fashion, then areas are de-metallised to leave on the paper a pattern of conducting metal equivalent to rectangular segments joined together by thin bands.

The segments increase progressively in length along the pattern, each segment being equal to the diameter of the equivalent layer when the capacitor is finally rolled up.

It is simply a matter of controlling the patterns to prevent the two coatings from touching at any point as the paper is rolled. The end connections are made and the sealing done in the usual fashion.

By increasing the gap between metallised segments it is possible to wind a blank section of paper between each layer, effectively doubling the dielectric thickness without introducing an extra paper feed.

VERY SMALL

Using these techniques it is completely feasible to produce tubular paper condensers as small as ¼-inch in length and 1/8-inch in diameter.

Much has yet to be learnt about the application of metallised capacitors in typical circuits and each should be studied on its merits.

In general, no sparking or deterioration should occur in applications where the applied voltage is less than 75 pc of the maximum rating. Above this figure, steps should be taken to ensure that the circuit will be able to clear any fault which develops.

In terms of size, metallised capacitors show to best advantage for 200-volt types. There is still some advantage at 400 volts but, in 600-volt types, the difference in size is small and the main advantage of the metallised paper type is in its self-healing characteristic.

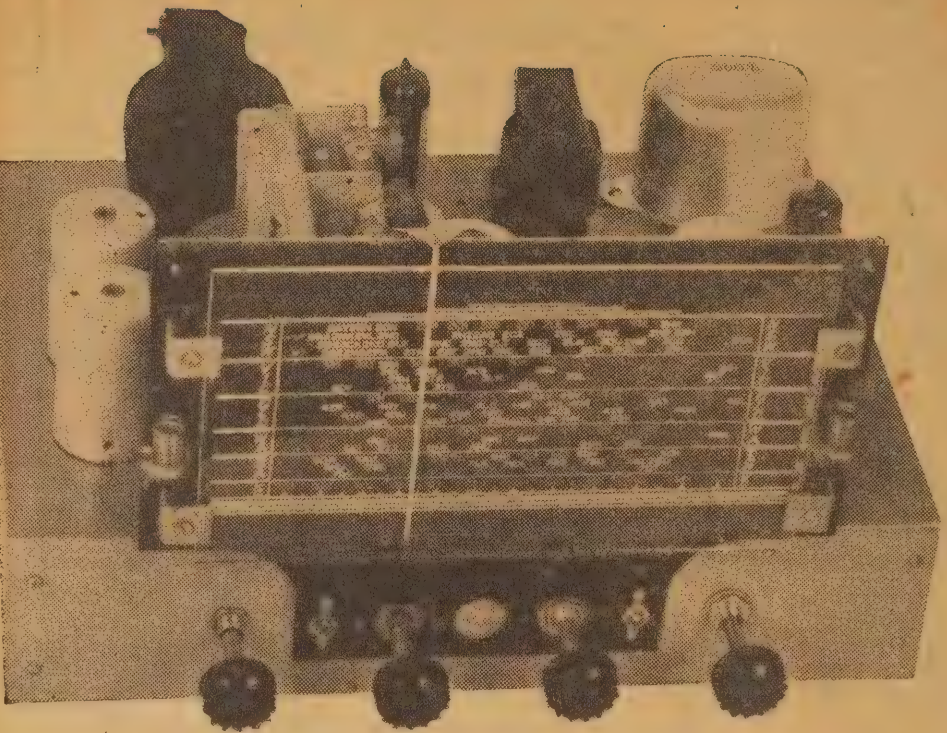
Telephone Amp. Coil Kit
Comprising 2—500 ohm. Coils.
5—Strips of Mu Metal cut to size.
Price only 9/-. Postage 1/-.
AMPLASOUND CO., Cr. Buckingham & Cleveland Sts. (opp. Demco), Sydney.

Products of Australia's Pioneer and Leading Tape Recorder Engineering Establishment
FERRY DELUXE RADIO-TAPE RECORDER

- Full Track or Half Track.
- 3¾ & 7½ i.p.s. tape speeds (1⅞ & 3¾ to order).
- Radio tuner with built-in aerial.
- Monitoring, P.A. features.

TAPE RECORDER
Available with all above features but without Radio Tuner section.

Available from your local dealer — or direct from:—
FERRY SOUND INDUSTRIES
175 Woodland St., Balgowlah, N.S.W.—XJ1856
Springbank Road, Clapham, S.A.—U2446.



- Five valves
the performa
quired of a
estic receive
circuit coul
have been d
for factory
tion.

- The audio
the receiver
able for
pickup and g
cellent perf
on both s
and microgr
cording

- All parts ar
able direc
radio dealer
At the same
would be
build an e
receiver f
mone

- Just the th
people who
good cabi
an out-of-da
sis which th
like to repl
one of
desig

YOU CAN BUILD THIS RECEIV

Our latest 5 valve receiver is designed so that anyone with a mechanical mind and an ab to follow instructions can assemble the parts and make the set work at full efficiency. Th made possible by a drawing of the underneath of the chassis which shows all parts and in their correct positions and proportion. Even if you have never built a set before, he one you can tackle with confidence.

by Maurice Findlay

MOST 5-valve receivers which can be purchased ready-made and installed in cabinets, follow the same general electrical design. Certainly, the cabinets vary, and all sorts of different dials and knobs are fitted, but you will generally find that the valves are used to perform the same functions and that there is little difference in the basic circuit.

There is little need for difference. Five valves can be made to do an excellent job on radio. In fact, few listeners ever use the full sensitivity of which a modern 5-valve receiver is capable.

RECORD REPRODUCTION

The audio section of the receiver consists of a two-stage amplifier. If brought out separately, it has plenty of gain for a crystal pickup for either standard or microgroove recordings.

There isn't sufficient gain for some of the super quality, low-output magnetic pickups, but people who are interested in these sort of things usually go in for elaborate amplifiers, anyway.

The set can be installed in a table cabinet with a 6in speaker if desired, or, with a good 12in speaker, would be perfectly at home in an elaborate console. Most people have their own definite ideas about this matter, depending on the layout of their home, so we will say no more.

As far as the electrical circuit is concerned, every effort is made to simplify it as much as possible without prejudicing the performance. As a matter of fact we have adopted exactly the same procedure as would a commercial manufacturer designing a 5-valve radiogram and sults are much the same.

Now for a brief run ov of the electrical details.

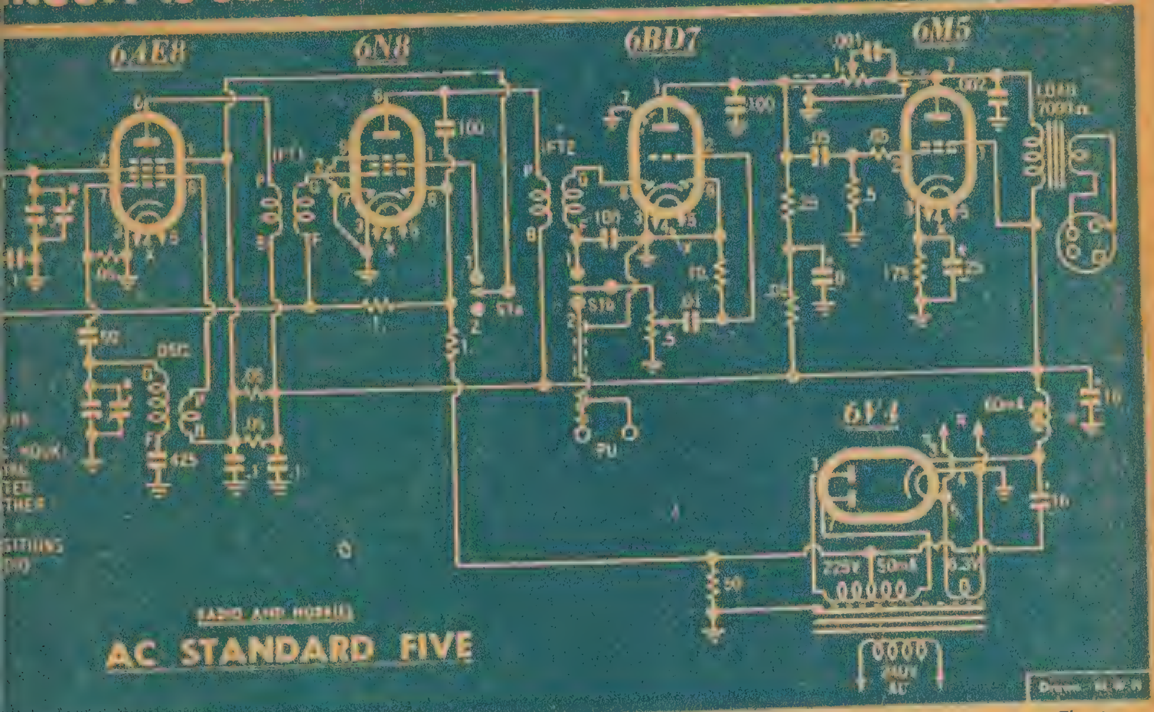
In this case, the screens 6AE8 and the 6N8 as well plate of the triode section 6AE8 are operated from t source. Thus a single pape serves a triple function. only a single dropping re required, but in order to power loading on individua ors low we have made up quired value by connectin watt resistors in parallel.

SAVING COMPONENTS

The bias system for th in the RF section of the s designed with the idea of the total number of co Both RF cathodes are eart

The grids of the RF v returned to the AVC line, in turn, brought back to tive potential obtained main high tension supply. rangement requires at l components fewer than the tive where both valves ha

RCUIT IS SIMPLE BUT GIVES GOOD PERFORMANCE



ul circuit design has enabled a number of components to be saved without detracting from the performance. The tuner is effectively silenced when playing records by removing the screen supply of the IF amplifier.

ıthode resistors and bypass ors.

her component is saved by grid leak bias for the 6BD7 amplifier. The idea is that value resistor is placed be- the grid of the triode section arth. Some of the electrons the hot cathode have suffi- energy to reach the grid and ack through the resistor. Thus ential is developed across the r by the electrons, and this to provide bias for the valve.

arrangement is not suitable her valves in the set for rea- which we won't go into here n the case of the 6BD7, it a component and simplifies wiring without carrying any ies.

s for the output valve is ob- with the conventional cathode or and bypass capacitor. Back- could have been used as for RF valves, but the number of onents would have been the and the wiring slightly less htforward.

ND DESIGN

hough we have saved com- nts wherever possible we have avoided extra components in where they could be includ- advantage. Examples are the decoupling network consisting e .05 meg resistor, and the 8 capacitor. They could be done out, but only at the expense higher hum level than we der desirable.

most sets, the .05 meg stop- resistor in the 6M5 grid could one without, but it is a wise aution against instability with high-gain output valve.

gative feedback is applied to the output valve with the result that frequency response and distortion characteristics are very much improved. The tone control operates by increasing the feedback at high frequencies. The effect is to reduce the gain of the set at high frequencies and thus provide treble cut.

This is the function of the tone control as fitted to radio receivers you buy in the ordinary way. Anything more elaborate comes within the realm of the audio enthusiast, who is prepared to get the best results regardless of the additional complication.

With the tone control operating on the negative feedback circuit, the action of the control is particularly smooth. This is a definite advantage when selecting the desired amount of cut.

The mains on-off switch is mounted with the tone control potentiometer in such a way that when the set is switched on the response is adjusted to give full treble response. This is the position in which you will operate the set on

PARTS LIST

1 chassis 12½in x 9in x 2¾in.
1 power transformer 225V a side at 50 mA, 6.3V at 2A.
1 60 mA filter choke.
1 2 section standard tuning capacitor.
1 dial with glass to suit gang (USL32).
1 standard aerial coil.
1 standard oscillator coil to suit 6AE8.
2 standard IF transformers (Nos. 1 & 2).
1 2 pole 2 position switch.
1 permanent magnet speaker, size as required.
1 speaker transformer to reflect 7000 ohms from voice coil.
5 9-pin miniature sockets.
1 adaptor plate (see text).
1 miniature speaker socket with plug.

VALVES

1 6AE8, 1 6N8, 1 6BD7, 1 6M5 and 1 6V4.

CAPACITORS

1 25 mfd 40 PV electrolytic, 2 16 mfd 525 PV electrolytics, 1 8 mfd 525 PV electrolytic, 2 .1 mfd 400 V paper, 1 .1 200 V paper, 1 .05 400 V paper, 1 .01 600 V paper, 1 .002 mfd mica, 1 .001 mfd mica, 1 425 pf mica 5 pc tolerance, 3 100 pf mica, 1 50 pf mica, 2 0-30 pf trimmers.

RESISTORS

1 10 meg ½ watt.
2 1 meg ½ watt.
1 1 meg potentiometer with switch.
1 .5 meg ½ watt.
1 .5 meg potentiometer.
1 .25 meg 1 watt.
3 .05 meg 1 watt.
2 .05 meg ½ watt.
1 175 ohm 1 watt.
1 50 ohm 1 watt.

SUNDRIES

4 knobs, power flex and plug, 4 terminals, 2 6.3V .50 mA dial lamps, 1 7-tag mounting strip, 1 8-tag mounting strip, hook-up wire, shielded wire, spaghetti tubing, solder, solder lugs, nuts and bolts, washers, rubber grommets, etc.

HOMECRAFTS

RADIO IS OUR BUSINESS

YORK ST
BARRACK ST
CLARENCE ST
KING

100 CLARENCE ST., SYDNEY. BX 4451
ALSO 26 HUNTER ST., NEWCASTLE

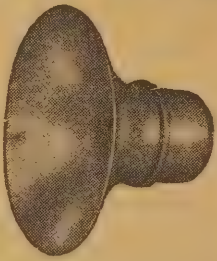
AMPLIFIERS

The Elcon range of high quality Amplifiers

Prices

15 Watt A.C. £47/18/6

15 Watt A.C. and 12V D.C. £52/4/-



Large stocks Flares, Speaker
Speaker Boxes, etc

Prices

30 Watt A.C. £54/13

5 Watt A.C. £22/4/

3 SPEED RECORD PLAYERS

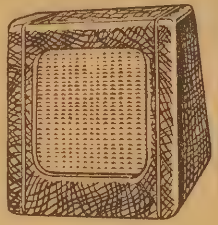
Collaro 31534

Garrard Md. T—Monarch Auto Changer

DE-LUXE EXTENSION SPEAKER

CABINETS—EXPANDED ALUMINIUM GRILLE.

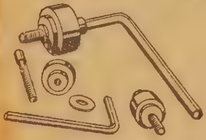
Sizes 6in, 8in, 12in. For Rola speakers—leatherette covered.



ZEPHYR 8xA MICROPHONE

£7/13/-

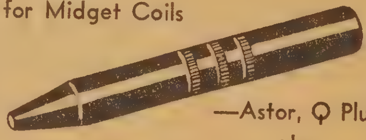
Screw-Type Hole Cutters



7-pin Miniature Innoval, Octal Set of Three

£5/7/6

Aligning Tool for Midget Coils



—Astor, Q Plus etc.

4/- each

WATCH • THIS • CORNER

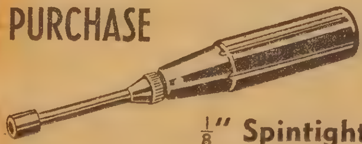
6ft Side Mount Car Aeri
£1/15

Special 4-pole, 3 Positi
1 Bank Switches 5

Q-Plus Extension Speak
£2/17

Lustraphone Press to Ta
Hand Set £7/10

SPECIAL PURCHASE

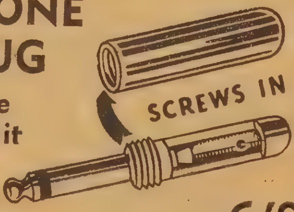


1/8" Spintights

6in long as illustrated 3/-

PHONE PLUG

Single Cricuit



Shielded 6/9

HOMECRAFT'S FAST DESPATCH SERVICE

YOUR ORDER
IS
ASSEMBLED BY EXPERTS
AND
RUSHED TO YOU

sions with good quality
ams and ordinary 78 rpm

where there is a lot of
e or poor quality pro-
distortion can be made
able by turning the con-
clockwise direction to in-
me treble cut.
ove recordings have some
treble emphasis, and, to
level response when the
e reproduced, some treble
ecessary. This can also
uced with the aid of the
rol. Actually, the maxi-
ount of cut possible with
onent values shown gives
rall treble cut, even when
icrogroove recordings.

ESPONSE

rsonal taste is for extend-
treble response as far as
but there are plenty of
ical listeners who like to
their sets with the tone
orking hard. It is not our
be dictatorial in such mat-

mplete a discussion of the
some remarks about the
upply are necessary. The
plifying valves in the set
a total of about 50 mA at
s for the various plate and
upplies. This must be smooth
urrent.
e filaments a 6.3 volt sup-
equired. This may be al-
current, since its only pur-
to provide the heat neces-
bring the valve cathodes
he required operating tem-

are a number of arrange-
sing components easily avail-
hich could have been used.
e chosen the arrangement
ses the least expensive com-
and at the same time takes
um of power from the mains.

SUPPLY

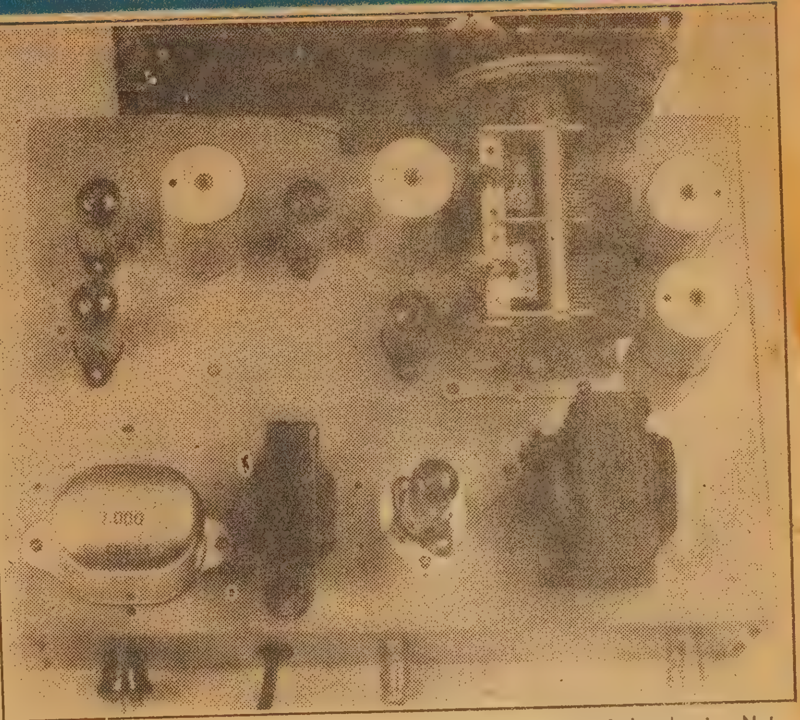
transformer has two second-
dings. One delivers 225 volts
side of a centre tap. The
tap returns to earth through
k bias resistor, and the two
leads to the plates of the
By the usual rectifying
pulsating unidirectional cur-
pears at the cathode. This
ed into smooth direct current
action of the two 16 mfd
ytic capacitors and the iron
ilter choke.
6V4 rectifier valve has a low
impedance, and, therefore,
mum of power is wasted in
rm of heat. The filament
too, is low when compared
ther types, so that here again
s a saving.
ature of the 6V4 is a heater
parate cathode with a layer
lation between them capable
hstanding the full high ten-
ltage. The heater can, there-
be operated from the same
rmer winding as the other

uple of points about the pre-
on of the schematic circuit
onfuse inquiring minds.
6AE8 is a triode-hexode with
al connections between the two
s so that the signal generated
triode high-frequency oscil-
is injected into the mixer section. To show all the details in the schematic circuit would make the diagram more complicated than is strictly necessary.

We have simply drawn symbols for the elements to which you will have to make external connection. Pin 8 is the connection for the oscillator plate, but it is convenient to show it on the diagram as a grid.

Similarly, the 6M5 output valve contains a suppressor grid which is connected to the cathode internally. Since you don't have to worry about this, when wiring up the set, we have left it out.

A REAR VIEW OF THE RECEIVER



The five miniature valves leave plenty of space to spare on top of the chassis. Note the trimmer capacitors which are soldered on top of the tuning gang. Make sure that the plates touched by the aligning screwdriver are connected to earth.

Resistor Color Code

Value	Body Color	End Color	Dot Color
10 meg	brown	black	blue
1 meg	brown	black	green
.5 meg	green	black	yellow
.25 meg	red	green	yellow
.05 meg	green	black	orange
175 ohms	value usually marked		
50 ohms	green	black	black

After you bring home your kit of parts there is a certain amount of mechanical work to be done before you start on the wiring. None of it is any more difficult than assembling the parts of a toy construction kit, but we have seen plenty of otherwise good sets, which were unsatisfactory because of parts not securely mounted.

Practically all the mechanical assembly is done with 1-8in diam. bolts and nuts. We suggest that you have on hand about 3 dozen bolts, 4 dozen nuts and ½ dozen washers before starting on the job. The bolts may conveniently be 3-8in long and the nuts should be reasonably thick so that there is not too much tension concentrated on individual threads of bolts holding down power transformers, &c.

The chassis which was used for the 1952 "Advance" and the 1952 "Junior Radiogram" receivers is particularly suitable for the new design and rather than burden the chassis manufacturers with yet another design we have used it again.

There are four extra 1-8in holes required to mount the power transformer. We will advise the chassis people about them so that they will be included in new chassis but, if you happen to get one of the older chassis, there should be no difficulty in drilling the extra holes for yourself.

MECHANICAL WORK

An octal-based rectifier was used in the previous receivers and it will be necessary to obtain an adaptor plate to mount the noval socket. These adaptor plates are stocked by all dealers.

The choke and speaker transformer fit into holes which were included in the chassis previously and therefor should cause no difficulty. Th speaker transformer is a fairly larg type put out by the speaker manu facturer. The majority of speaker nowadays are sold separate from th transformers and there are advantages in mounting the transforme on the chassis rather than on th speaker.

Most likely, the two primary leads will be brought out with a pair o

(Continued on Page 63)

HI-FIDELITY ENJOYMENT . . WITH A "PLAYMASTER"!

There is a Playmaster unit to suit every requirement of the hi-fidelity enthusiast. Designed by "Radio & Hobbies" and produced in kit form or completely built by the specialists, Electronic Parts Pty. Ltd.

These, and other amplifiers are described in our Amplifier Price List. Send coupon. Write or call for your copy.

The Playmaster range include

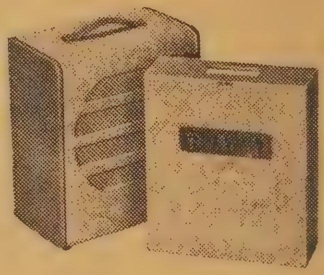
- ★ **Amplifier No. 1** (5 Valves 18 W
- ★ **Amplifier No. 2** (5 Valves 10 W
- ★ **Amplifier No. 3** (3 Valves 4 W
- ★ **Amplifier No. 4** (3 Valves 4 W
- ★ **Amplifier No. 5** (5 Valves 10 W
- ★ **Amplifier No. 6** (5 Valves 8 W
- ★ **Vibrator Amplifier** (6 Volt)
- ★ **Tuner No. 1** (2 Valve D/W &
- ★ **Whistle Filter**
- ★ **Tuner No. 2** (3 Valve T.R.F. Filter)
- ★ **Wide Range Tuner** (1900 KC Filter)
- ★ **Wide Range Tuner No. 2** (455
- ★ **Control Unit No. 1** (1 Valve Vol. Cont.)
- ★ **Control Unit No. 2** (De Luxe Mo
- ★ **Control Unit No. 3** (Special T

A SPLENDID PORTABLE P.A. AMPLIFIER

A versatile 10 watt portable unit available either for A.C./Vibrator use, or A.C. only. Ready to pick up and take away to whatever function needs it.

Available as kit of parts for A.C. only or AC/Vibrator also completely built if required. Full details in our free kit set catalogue.

We can also supply kits of parts for many other sets to "R & H" circuit designs. Amongst these are radiograms, amplifiers, vibrator sets, Battery sets, etc., etc. Mail coupon now for full details of range.



10 WATT
PORTABLE AMPLIFIER

ELECTRONIC PARTS PTY. LTD.
209 Broadway, Sydney.

Please send me (without obligation)

☐ Kit Set Catalogue. ☐ Amplifier Price List.

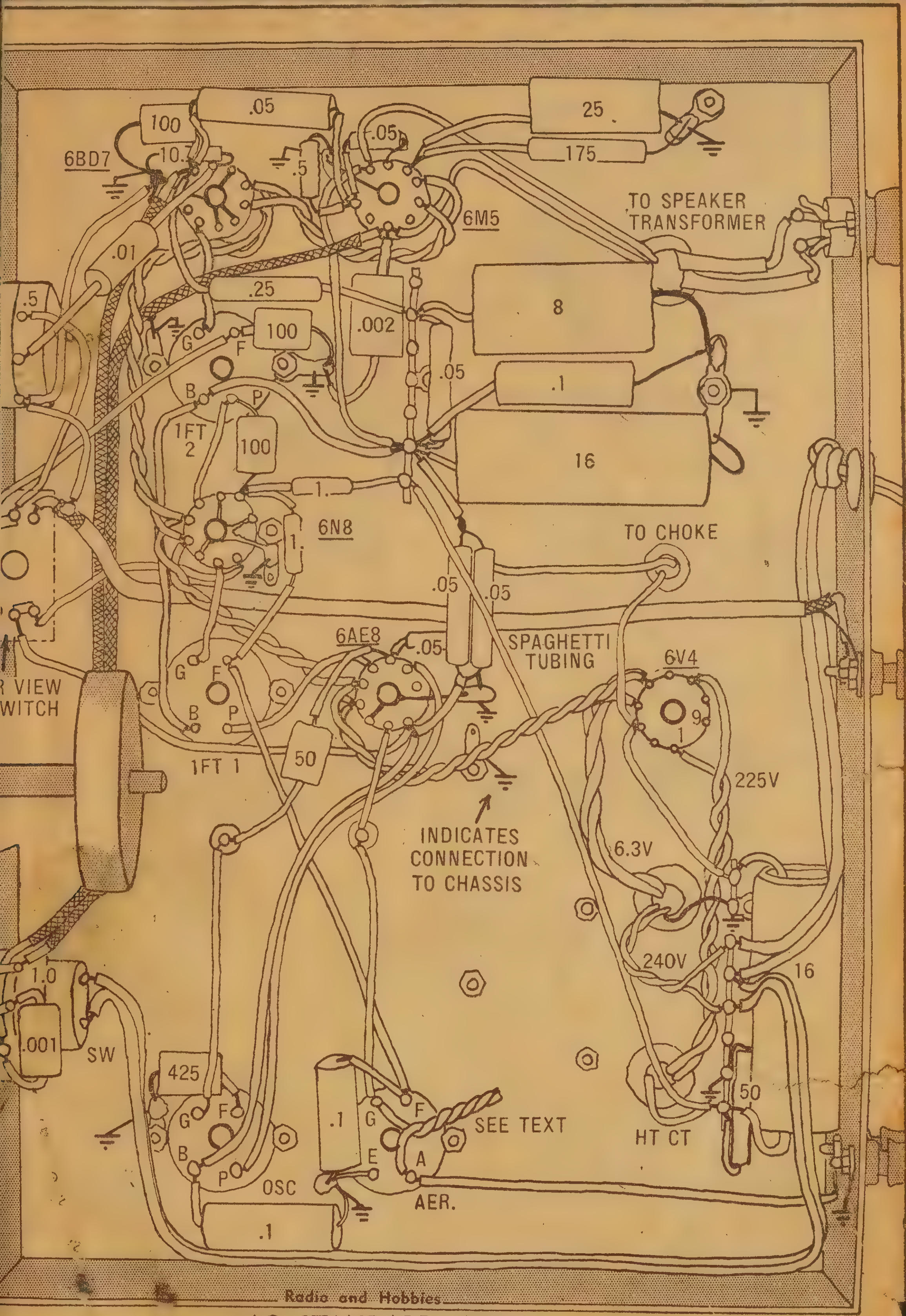
(Check which required).

NAME ______________________

ADDRESS ______________________

ELECTRONIC PARTS PTY. LTD.
E. S. & A. BANK BUILDINGS,
BROADWAY, SYDNEY, N.S.W.
PHONE MA1661.
Telegrams: ELECPARTS, SYDNEY.

DIAGRAMS SHOW EVERY WIRE IN PROPER PLACE


100
.05
25
10.
6BD7
.5
.05
175
6M5
TO SPEAKER TRANSFORMER
.01
.5
.25
8
G
100
.002
F
.05
B
P
.1
1FT 2
100
16
1.
6N8
1.
TO CHOKE
.05
.05
R VIEW WITCH
6AE8
.05
SPAGHETTI TUBING
G
F
6V4
B
P
9
1
1FT 1
50
225V
INDICATES CONNECTION TO CHASSIS
6.3V
240V
1.0
16
.001
SW
425
50
G
F
F
G
.1
SEE TEXT
B
E
A
HT CT
P
OSC
AER.
.1
Radio and Hobbies

AC STANDARD FIVE

for your guidance, is the most detailed wiring diagram we have yet prepared. It's difficult to see how you could go wrong.

NOTHING BUT TAPE RECORDER

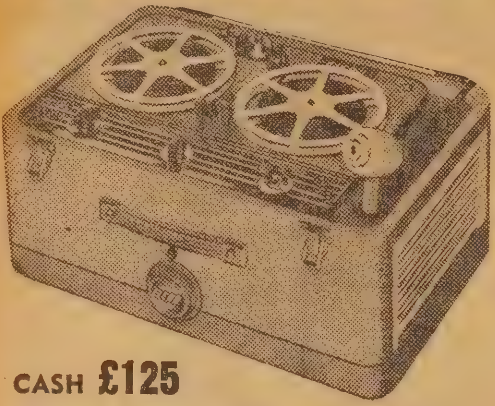
Take one home from Magnetic Sound fro

We sell to the public and trade only the very best on the Australian market and our long experience in this type of equipment is your safeguard when buying a Tape Recorder. We will not "push" any one type but advise on merits, application and quality. Then, when you decide to buy a Tape Recorder, you may buy it for cash or on a low deposit and easy monthly repayments

£1

Deposit & Ea
payments

All recorders advertised are from reputable manufacturers a covered by reliable guarantee. See these and others right IN town Magnetic Sound.

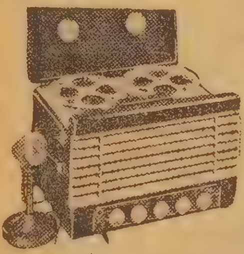


CASH £125

Standard Model

"ELCON" TAPE RECORDER, deposit £17/10/-

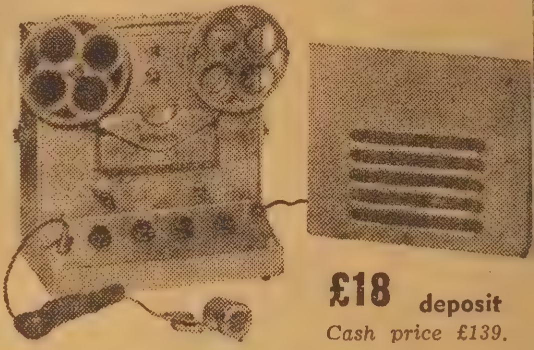
The latest model two-speed, fast forward "Elcon" that is truly top value at £125. "Elcon" RADIOCORDER is similar, with built-in 7-valve radio as well as full recording unit and features. Yours for £20 deposit.



£15 deposit.

TWIN TRACK SAPPHIRE, £138/10/-

A really super Tape Recorder with separate bass and treble, 2 hours' recording on twin tracks, two speeds, two heads, electro-dynamic braking and take-up. Fast forward and rewind. Three motors are used to overcome mechanical complications.



£18 deposit

Cash price £139.

MOVIE TAPE "TECHNICORDA"

For real home talkies Technicorda links directly wi any 16, 8 or 9.5 mm. projector for perfect sound sy chronisation. The speaker separates from carrying ca as shown above and will operate as an inbuilt publ address system also. Two hours' recording on one ree See it in action with a movie projector at Magnet Sound.

"Nothing but Tape Recorders"

Magnetic Sound

Industries
(AUST.),
SYDNEY.

KITSET

Exclusive Elmec 1954 Release, £34/10/-. Comprises 2 twin track heads, dual speed, oscillator coil, Hoover motor, balanced fly wheel. All parts beautifully made, simple to assemble at home with screwdriver and pliers Fully guaranteed. Full kit, £34/10/-.

COMPLETE "ELMEC" DE-LUXE DECK

1954 release, ready made and tested with twin track heads, 3¾in and 7½in speeds, 2 motors, fast forward and rewind, £43/10/- or £8 dep. and terms.

Flywheels, 2-speed, balanced and ground	£3	19	6
Pinch wheels		10	6
Reel holders, ¼ or 3-16in shaft. Each		12	6
Osc. Coils and Circuit		18	6
HEADS—ELMEC, twin track, dual gap	£4	17	6
M.S.I. twin track, adjustable guide clip, 50-8500 cps. ..	£5	9	9

AND NOW THE NEW

GRUNDIG *"Reporter"*

With exclusive PUSH-BUTTON CONTROL. TWO-SPEEDS. IDEAL FOR MUSIC. See full details in Magnetic Sound's half-page advertisement on page 90 of this issue.

£25/-/- deposit. Cash Price 150 guineas.

RECORDING TAPE

SCOTCH BOY		**AGFA**	
1200ft. ..	£3/10/-	1200ft. ..	£3/12/6
600ft. ...	£2/2/6	600ft. ...	£2/5/-
B.A.S.F.		**SPOOLS**	
1200ft. ..	£3/12/6	7in. Plastic,	10/6
600ft. ...	£2/5/-	5in. Plastic,	9/6
		7in. Metal,	10/6
E.M.I.	£2/18/-	5in. Metal	8/6

MAGNETIC SOUND INDUSTRIES (Aust.)

New and only Address

385 GEORGE ST. OPPOSITE STRAND ARCADE

TAKE LIFT TO LOWER GRD. FLR.

OPEN SATURDAY MORNINGS 9-12 BX4440 BX4440 ic insulated wires but the two idary leads will be a couple of thin tinned copper leads. Cut off about 1in long and solder iple of lengths of hook-up wire iem. Take two pieces of spag- tubing each just large enough ass over the hook-up wire and them down so that they cover inned copper wire and the hook- vire.

ace a rubber grommet in the ap- riate hole in the chassis and the four leads down through chassis. The transformer can be bolted in place but include or three washers between the sis and the transformer in each to that the wires are not aged by being pressed against chassis.

ne secondary wires go to the out- socket on the back of the chassis the primary wires to the 6M5 et.

nere is little need for comment he mounting of the various valve ets, the IF transformers, the al and oscillator coils and the ng capacitor. Check their ntation with the underneath ng diagram. This diagram also vs the positions of the various rols, the terminals, the output and the tag strips all of which be mounted at the same time.

BBER GROMMETS

on't forget to include rubber nmets in the chassis holes, ugh which pass the wires to the ver transformer, the filter choke the main power cord.

ote that all terminals except the th terminal should be insulated n the chassis. The "earthy" pick- terminal actually returns to the ssis near the 6BD7 socket. It is advisable to mount the dial at stage because of the possibility he dial glass being broken while are doing the wiring.

inally, before starting on the ing it is worth while to get hold couple of pieces of wood or other ports to hold the chassis upside vn without the IF transformers, touching the bench.

This is well worth while because will take you several hours to e the set during which time you ıld easily damage the IF trans- mers, particularly if they are of type with a core adjusting screw king up through the top.

ncidentally, we have noticed that plating on the valve socket lugs d IF transformer lugs is not al- ys as good as it could be. If you in any doubt, it would be a od idea to tin all lugs before unting the components using a ife to scrape away oxide coatings ere necessary. Be sparing with ste flux. It may lower the resist- ce between socket lugs and also lps to collect dust.

If you haven't had any previous perience in soldering small wires would be a good idea to practise scraps.

IRING DIAGRAM

The next job is to make a pre- ninary study of the underneath ring diagram. You will find it rticularly useful as it was made m an actual underneath photo- ıph of the set, and, therefore, all res and components are shown their exact position and propor- n.

In order to make everything visible we have had to alter our usual wiring style a little. However, there is little room for complaints even from the most critical enthusiasts. All components are firm and the wiring is short and direct.

You will note that there are a number of earth symbols. These indicate that a connection is made to the chassis at the particular point. Except in the two cases where the chassis connection is made via the mounting feet of the tag strips, the connection to earth is made via a solder lug held under a mounting bolt. The lugs can be put in place when the components are being mounted.

EARTH POINTS

There is a possibility that the paint on the chassis will prevent a good connection. The best way to overcome the difficulty is to run a length of thin tinned copper wire around all such points connecting them together. If some of the earth points do not happen to make good contact with the chassis, it will not matter.

Filament wiring should come next. Take a couple of pieces of hookup wire each about 3ft long and twist them together into a compact pair. You can do it quickly and neatly if you hold one end of the pair in a vice and twist the other end with a pencil.

The filament wiring should be returned to earth at one point in order to prevent hum. In our case it was returned to earth near the rectifier socket.

The leads from the power transformer can be identified from the manufacturer's color code, and it is a simple matter to solder them in place in accordance with the wiring diagram.

Next in line are direct connecting wires and finally the various small resistors and capacitors.

There are four electrolytic capacitors in the set altogether. These capacitors have a definite polarity and should be connected as shown. Where paper capacitors are used for bypassing a circuit to earth the outside foil, sometimes indicated by a dark band, should be connected to earth. There are three such cases in this set.

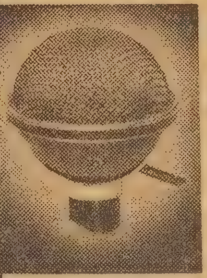
The polarity need not be considered for any of the other capacitors nor any of the resistors.

COIL CONNECTIONS

It is possible that brands of coils other than those used in the original set will have slightly different connections. You can easily check this from the data on the coils themselves or the packets. The important point is to turn the coils so that the plate and grid leads are as short as possible.

Some manufacturers recommend some extra capacitance between the tops of the aerial coil primary and secondary in order to keep the gain of the set constant over band. The required value can be made up by twisting a couple of lengths of hookup wire together. Advice on this matter will be given by the coil manufacturer. If it is not mentioned it is possible that the required characteristics are incorporated in the design of the coil.

In some cases the IF transformer which goes between the 6AE8 and the 6N8 will have a lead coming out through the top of the can.



AWA
RONETTE
MICROPHONES & ACCESSORIES
Type O88
£8/12/-
Technical pamphlets will be mailed on request.
Other types also available from
NOYES BROS.
36 ARGYLE ST., HOBART
and leading wholesalers.

TRANSFORMERS, CHOKES
MADE TO ORDER
Specialised Service. Write for Quote.
25 watt 30—17000 c/s plus minus 1db 10000 PP to 15, 3.75 ohms. 111/8
12 watt 35—14000 c/s plus minus 1db 10000 PP to 15, 8, 2 ohms. 73/3
6 watt 50—12000 c/s plus minus 1 db 7000 SE to 8, 2 ohms. 42/3
POST FREE within Commonwealth!
ALSO LOW HUMFIELD POWER TRANSFORMERS, POWER CHOKES.
Send S.A. Envelope for Price List.
TRANSONIC CO.
Box 30, P.O., Balgowlah, N.S.W.

RADIO ACCESSORIES
We specialise in Radio Parts and stock all reliable brands. We can supply: Coils, I.F.'s, Transformers, Resistors, Tubular Condensers, Valves, Wires, Flex, Meters, Testing Equipment, Radio Manuals, Irons, Toasters, Pressure Cookers, Jiff Toasting Irons, Trimmers, Padders, Gang Condensers, Motor and Pickups, Record Changers, Cabinets, Solder Irons, Solder and Electrical Accessories, 4 and 5 Valve Mantel Sets — Portable Sets, Console Radio and Radiogram, etc. Mantel, Console and Radiogram Cabinets. TECNICO Electric Lawn Mowers, Floor Polishers and Vacuum Cleaners.
2 and 3 Speed Motors and Turntables.
G.P.20 Pickups and Microgroove Heads.
DAVIS RADIO CO.
Wholesale Radio Distributors,
1st Floor, Wembley House,
841 George St., Sydney.
Next Glaciarium
Phone M3917
OPEN SATURDAY MORNINGS

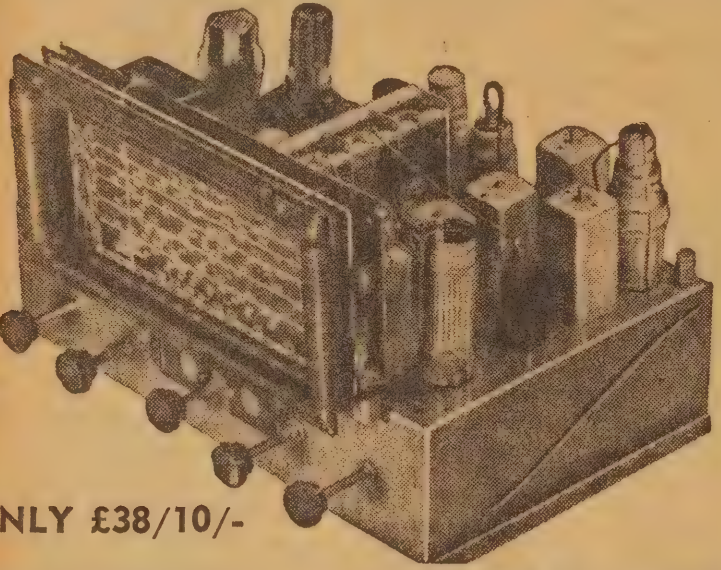
THE LATEST GEX MODEL CRYSTAL SET with Germanium permanent fixed crystal detector. In leatherette covered case, size 6in x 4in x 2½in, £4/6/9. Complete with headphones, £6/5/-.

Midget Crystal Set 57/6, Phones 38/4.

1 valve mantel model radio in leatherette covered case 6½in x 4½ in x 5⅜in with headphones and batteries, £7/16/-. Also available in a leatherette covered portable case 9in x 5in x 6in, £8/10/-.

2 valve mantel model radio in leatherette covered case 8in x 5¼in x 2¾in with 3½in speaker and batteries, £9/17/6, or in a leatherette covered portable case 9in x 5in x 6in, £10/10/-.

Ideal sets for use in hospitals or as a second set for household use. Battery life approximately 6-9 months. Replacement batteries 22/3 per set. Country clients please allow for freight.



ONLY £38/10/-

FOR THIS 8-VALVE DUAL WAVE RADIO

Here's value only to be found at Radio House Pty. Ltd. This readymade and tested chassis is complete with valves and 12in permagnetic speaker. Complete in every detail, it's easily fitted into your radio or radiogram cabinet and can be supplied with a polished wood front panel. Ideal for overseas reception, fitted with phono pick-up terminals, and has two separate tone controls for treble and bass boost. Size 16in x 10½in x 9in high.

SOUND AMPLIFIERS

For Phonograph Pick-up and Microphone

240 volt A.C. models complete ready for use (without cabinet, microphone or pick-up).

3 valve with 8in speaker, £12/17/6 (suitable for phono pick-up only, 4 watt output). 12in speaker £1 extra.

4 valve midget with 8in speaker, £13/15/- (suitable for phono pick-up and microphone, 4 watt output). 12in speaker £1 extra.

5 valve with 12in speaker, £21/10/- (suitable for phono pick-up only, 8 watt output).

6 valve with 12in speaker, £25/-/- (suitable for phono pick-up and microphone 12 watt output).

SPECIAL MODELS MADE TO ORDER

6 volt battery-operated 3 valve and vibrator with 8in speaker, £18/10/- (suitable for phono pick-up and microphone 4 watt).

SPECIAL CUT-PRICE LINES AT GIVE-AWAY PRICES

A.W.A. Vibrator power supply 4v. to 90v. at 20 m/a. New and complete, 37/6,
Dropping resistor for 6v. battery, 9/-; for 12v., 14/- extra.
Resin cored solder, 1lb. reel, 10/6.
Chassis 3⅝in x 3⅛in x 1⅞in, 1/6. Panel to suit, 6d.
Collaro phono motor and pick-up, 240v. A.C., £5/5/-. Reduced from £9/17/6.
Combination Tool, 10in hammer, pincers, staple puller, 2 wire cutters, wire grips. Forged steel. German manufacture, 22/6. Reduced to 15/-.
Electron Aerial Wire—two 50ft coils, 4/-. Chrome swivel head torch, 26/6 complete.
Swiss-made 240 volt A.C record changers for 8 records—crystal pickup, £12/7/6.
"Scope" Electro-plating set. Plates nickel, copper, tin and zinc, 49/6. Gold, 15/9, or silver 1[illegible]/6 extra.
Wizard c[illegible]-on Lamp Holder Bracket with ball and socket swivel. All metal. Suitable for workshop or bedlamp, 7/6.
Shop-soiled Stromberg Carlson 3-speed Record Changers, £22/-/-.
English TELSEN 3ft 2-note Door Chimes, £3/9/6. Small Model, 42/6.
Pruning shears, 9in Polished Steel. Imported, 17/6. Reduced to 10/-.
Goldring Gramophone Soundbox Speakers. 15/6. Reduced to 5/-.
Spring Phonograph Motor with Turntable, 47/6.

All the above can be had by Mail Order, Freight Charges to be added.

RADIO HOUSE PTY. LTD.

296 PITT STREET, SYDNEY

This is intended for use with
older style valves having a g
connection to a top cap. In t
case, we suggest that you cut it
so that it sticks about 1in abo
the can, and then place a piece
spaghetti over the end of the w
so that it covers the end of
wire with about ¼in to spare. N
polish can be used to hold it
place if there is any doubt in t
matter. When the cement is d
the wire can be pushed back throu
the hole in the can.

It is also a good idea to pl
lengths of spaghetti over leads
the various resistors and capacit
to prevent unwanted shorts.

There are three leads in the
requiring shielding. Two of th
go from the plates of the 6M5 a
the 6BD7 respectively to the t
control potentiometer. The o
side tinned copper braid should
connected to the earth system
some point in their length, but
particular point is not important

The third shielded lead goes fr
the pickup terminals to the pick
radio switch. At the terminals e
the outside braid goes to the up
of the terminals (chassis ups
down) and the inside conductor
the lower terminal. The upper t
minal is insulated from the chas

SPAGHETTI COVERING

A length of large diameter sp
ghetti tubing insulates the outs
braid of the shielded cable fr
the chassis on its run across to
switch. A wire goes from t
end of the outside braid to a
on the potentiometer, and ther
to earth near the 6BD7 socket.

The single point earthing te
nique is employed to prevent h
getting into the audio amplifier.

An important connection of
overlooked is the electrostatic sh
of the power transformer. It
usually brought out as a thin stra
ed wire with a loose cotton bra
This wire should be earthed. Failu
to do this may result in hum, wh
appears only when the set is tur
to a station.

Take particular care with all le
which connect directly with
power mains. We suggest that y
use twin plastic power flex rath
than hookup wire for the connecti
from the tag strip across to
switch on the back of the t
control.

As we mentioned earlier, rub
grommets are desirable where h
voltage leads go through holes
the chassis, so that there is no p
sibility of the sharp corners r
bing through the insulation.

CAREFUL CHECK

Before you switch the set on,
suggest that you go over the w
ing wire by wire. You may l
to mark out each wire on the d
gram with a pencil as you ch
it so that you can make sure t
all wires are accounted for in
finished job.

It is best not to do this just a
you have finished the wiring. Rat
leave it until the next evening w
you are fresh and less likely to m
a mistake.

Connect the speaker before
switch the set on. Stand by w
your hand on the power sw
ready to switch off quickly if a
thing goes wrong. Any sign
heating in any of the compone

(Continued on Page 112)

ROM THE—SERVICEMAN WHO TELLS

considered unethical for one doctor to criticise the work of another, there may be
similar objection to my telling you this story. Be that as it may, I propose to tell the
story anyway and let anyone whom it happens to fit, wear the cap.

ry had its beginning when
a request to look over the
system on a van used as a
nobile church. The ampli-
apparently never been very
ry and "could I possibly
ook at it, if we brought it
his evening!"

eared that someone else had
"had a go at it" without
ile result and, since the folk
d appeared to be in real
said I'd do my best.

the truck duly arrived, the
obvious requirement was to
amplifier in action. The
ords "one-two-three-testing"
d the comparative quiet of
et and caused several small
d dogs to come (and/or go)
at full speed.

USLY FAULTY

a few words, however, were
nt to indicate that the ampli-
s far from normal. It was
o feedback and overload long
it was delivering worthwhile
to the four speakers mounted
walls of the van.

serviceman, who had passed
ay just previously, must surely
een brought up on battery
es!

driver of the van seemed quite
d to hear me agree that the
ier was indeed faulty. He
on to explain that it had al-
seemed "harsh like that" and
icrophone seemed very direc-
too. "You have to talk right
."

amplifer was branded "15
' and further investigation
ted a pair of 807 valves in
itput stage. From the three
preceding them, I guessed
there would be a mic. pre-
fier, a voltage amplifier and
ase splitter ahead of them in
rcuit.

WARD INSTALLATION

re my "further investigation"
d like coming to a halt and I
to realise why the previous
eman had become not-so-keen.
see anything at all in the
ifier involved an awkward
d-eagling of the legs on the
combined with a sharp arching
he back and an upside-down
ire for the head. Add to this
glare of a headlight and gloom
ywhere else, and you begin to
a picture of the situation.

add to the misery of it, the
ker leads disappeared in a bunch
behind the panel work of the
k. They might have been con-
ed any old way at all, for all
could see.

s for the power lead, one end
iected to a multi-point plug
ch fitted the amplifier. The other end went down through the floor into outer darkness, terminating underneath in a couple of big battery connectors. These had been put on AFTER the lead had been threaded through the floor!

There it was and there it looked like staying.

Well, perhaps I could try some on-the-spot servicing. What about the 807's? Assuming the use of a phase-splitter, either valve should deliver output on its own.

Braving the hazards of hot glass, I pulled one 807 out of its socket and spoke my piece into the microphone "One-two-three-okay".

Now for the other 807. This time I was greeted by complete silence. One 807 wasn't working at all. Dud valve perhaps?

The valves were therefore changed over in their sockets and the test repeated. No, both valves were okay—one of the socket positions was dead.

Perhaps it was the output transformer, a shorted section in the winding?

By changing over the plate caps, this little theory was soon disproved. (Luckily there was apparently no feedback in circuit or it would have shrieked at me for doing such a thing).

FAULTY STAGE

No, there was something wrong with the socket position, not with the valve or the output transformer.

By dint of a little more wriggling I managed to get in a position where I could balance the amplifier across my knees and poke at the innards with the multimeter prods.

About this time, too, I discovered that I could test for dead or active circuits by listening to the click when I touched the multimeter on the voltage amplifier plate. It disturbed the neighborhood a lot less than my "one-two-three" routine into the microphone.

But alas, the 807 cathode circuit was in order, the screen voltage was normal and the grid circuit was likewise okay, as far as I could see. All except that it seemed quite dead!

At this stage I was just longing for a testbench, an audio generator and a CRO. And just at this stage the truck driver came good. Said he . . .

"Let's rip those wires out of the floor; I'll put the wires and the clip things back in the morning."

Boy did I rip!

Once on the bench, it was a different story. The amplifier was duly connected up to an audio generator and CRO, and I began to trace the waveform through each stage. There was nary a scrap of signal on the grid of the dead output stage.

But there was plenty of signal on the plate side of the grid coupling condenser! Apparently it was open circuited.

Once the condenser—a mica type—was removed from the chassis, the sorry tale was plain enough to see. The original paint marking on the bakelite had partly rubbed off and someone had scratched its value into the surface to avoid possible error.

Unfortunately the scratch mark said ".01" whereas the measured value and the faint outline of the paint (when you looked at it again) said 20. And 20pf isn't very effective as a coupling condenser to an audio output stage.

Unfortunately, there was more to follow. Having replaced the condenser with a new one, the CRO showed up a large discrepancy between the drive to the two 807 grids.

Closer inspection showed why: The .05 meg. plate resistor for the phase splitter had a bright yellow band around its middle! For as long as I can remember, .05 meg. resistors with bright yellow bands have been half-meg resistors.

By the time I replaced this component as well, the drive to the output valves began to look quite balanced, the output was cleaner and there was certainly a lot more of it. Wonderful the difference to an amplifier half an AB1 output stage makes!

Back in the truck, my "one-two-three-testing" sounded ever so much better, rolling out into the stillness of the night.

But that "Mic. Volume" control was still awfully touchy. A trifle too much and it would feedback "like a beaut".

"Wait a minute" I suggested and went inside to collect a wide range crystal mic.—not a broadcast type but one with a good quality insert. What a difference it made.

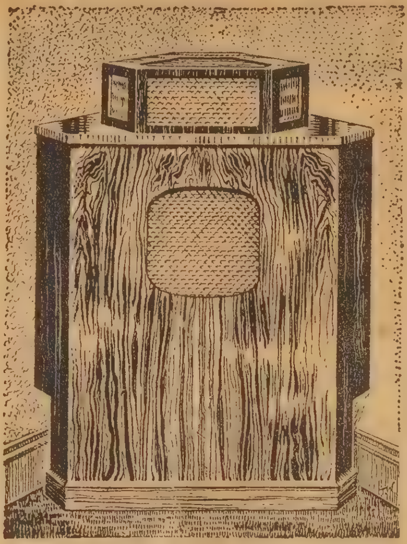
The tendency to feedback was enormously reduced and the speech was crisp and clean.

As I explained to the van's operator, the amplifier had originally been supplied with an ordinary speech type dynamic microphone. Rugged and all as these might be, many of them have a pretty solid peak in the middle of the range and very little real treble response.

MIKE PEAK

As a result, the speech tends to sound "metallic" and individual voices lose much of their character. It mightn't matter much for a chocolate wheel spruiker but it certainly isn't adequate for the requirements of a mobile church. I shouldn't think so anyway.

As for the peak, it often coincides very neatly with the peak of the loudspeaker's response. Thus, as the "Mic. Volume" is advanced, the system begins to howl its head off as



Sand-filled Corner Enclosure as recommended by Messrs. Wharfedale.

Illustration shows unit in use with middle and high frequency speakers facing upwards.

(N.B. This unit also recommended as the ultimate for the Super 12"CS/AL speaker and twin speaker systems.)

MESSRS.

Wharfedale

WIRELESS WORKS

Now represented in Australia
for Speakers and Cross-over Networks

Available to the trade throughout Australia:

WHARFEDALE Super 5": "Tweeter" for Twin- & 3-Speaker Systems.
WHARFEDALE Super 8"/CS: High Quality 8" Speaker.
WHARFEDALE Super 8"/CS/AL with Aluminium Coil. High Frequency Unit for Twin Speaker Systems.
WHARFEDALE W 10"/CS: Middle Speaker for 3-Speaker Systems.
WHARFEDALE 12"/CS: for Quality Reproduction as Single Unit Speaker or Bass Unit for Twin- or 3-Speaker Systems.
WHARFEDALE Super 12"/CS/AL: This is Messrs. Wharfedale's famous Single Unit Speaker covering the full Frequency Range, recommended where a Single Unit is preferred.
WHARFEDALE 15"/CS: High Quality Bass Speaker for either Twin- or 3-Speaker Systems (fundamental Resonance below 30 c/s).
WHARFEDALE Twin- and 3-Speaker Separators (Cross-over Networks), with built-in Volume Controls for High and Middle Frequency Speakers.

Further Information, also re Suitable Cabinets, available on request to all Qualified Dealers, or to . . .

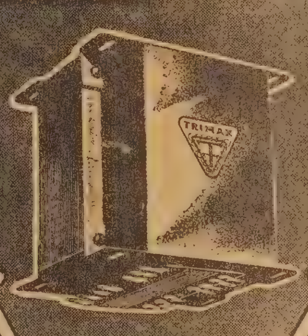
SOLE DISTRIBUTORS FOR AUSTRALIA

Simon Gray
RADIO DIVISION

28 ELIZABETH STREET MELBOURNE C1

Telephone: Central 2813

TRIMAX Quality



TRIMAX POSSESSES THE QUALITY YOU EXPECT FROM A TRANSFORMER

...UNIFORMITY

Uniform quality, performance, and appearance are distinguishing features of Trimax Transformers. Every unit is thoroughly checked before leaving our factory to ensure that it measures up to Trimax standards.

"Williamson" Amplifier enthusiasts! We can supply matching power and output Trimax Transformers in convenient reversible-mounting cases.

Transformers

TRIMAX TRANSFORMERS
(CLIFF & BUNTING PTY. LTD.)
CHARLES ST., Nth. COBURG.
Phone: FL 1203.
Telegraphic address: TRIMAX, Melb.

VIC.: J. H. Magrath & Co. Pty. Ltd.
Healings Ltd.
Radio Parts Pty. Ltd.
Homecrafts Pty. Ltd.

NSW: John Martin Pty. Ltd.
University Graham Instruments Pty. Ltd.
SA: A. G. Healing Ltd.
Newton McLaren Ltd.
Radio & Elec. Wholesalers Pty. Ltd.
Gerard & Goodman Pty. Ltd.
WA: Nicholson's Ltd.
Atkins (W.A.) Ltd.
Carlyle & Co. Ltd.
QLD.: Chandlers Pty. Ltd.
TAS.: W. G. Genders Pty. Ltd.

soon as the gain in this sensitive region reaches feedback level.

Elsewhere in the range, the gain is still only relatively low.

The crystal mic. which I tried in its place had a less significant peak much higher in the range. The difference in speech quality was literally enormous and you didn't have to be a professional radio "egg-spurt" to pick it.

What was no less important was that, by the time the system reached feedback point, the average gain over the whole speech range was much higher. By turning it close to this limit, the speaker could stand eighteen inches or so back and enjoy reasonable freedom of movement.

Without such freedom of movement, animated speakers tend to look rather like puppets, anchored by the mouth to an invisible skyhook.

One point more and, like the classic Eskimo, "my tale is told".

The tone control simply did not function as such, resembling in its action a subsidiary volume control.

Examination of the circuit showed that it consisted of the usual series-connected condenser and potentiometer, but strung between earth and the plate of the 6SJ7.

In a circuit of such high impedance, and lacking feedback anywhere, the condenser needs to be moderately small to attenuate only the higher frequencies. In this case it was .005 mfd.

With that in circuit, the only frequencies left were the ones the microphone wouldn't generate anyhow.

By the time I had reduced the said condenser to a fraction of its former value, the tone control also worked as it should. Shortly afterwards, the van and its driver made their way homeward, both presumably happy.

And now for a rather interesting case from a reader. He is Mr. S. G. G. of Glenhuntly, Victoria, and I quote the relevant portion of his letter below.

READER'S STORY

You may be interested in a repair which I had occasion to handle recently.

It was a home-made set made from an article in Radio and Hobbies. The customer complained that the set worked but seemed to lack power and had considerable hum present.

I decided, prior to plugging in, to make an inspection of the wiring, as some of the soldered joints were not really satisfactory and the whole arrangement under the chassis could do with a little tidying up.

While going over this I noticed that the coupling condenser from the volume control was connected to the plate pin of the volt/amp valve. This meant, of course, that this valve was taking no part in the signal build-up although, as it happened, it was functioning OK as a detector.

For some reason (maybe habit) I happened to check the 3-pin plug and noticed that the green wire was connected to one of the mains pins. Yet, on checking back of the chassis, I was surprised to find that the green wire was connected to the chassis!

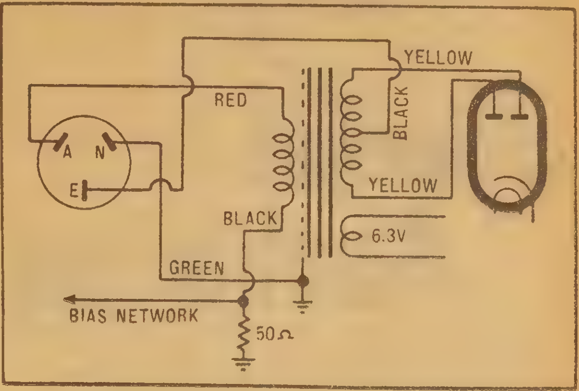
Perhaps I should have plugged it in again to see what was happening, but, instead, I connected the plug correctly and then switched on. The valves and dial lights did not light up so I disconnected the heater circuit at the transformer, suspecting that there may be a short in the heater network. However, there was no voltage on either the 6V or the 5V windings.

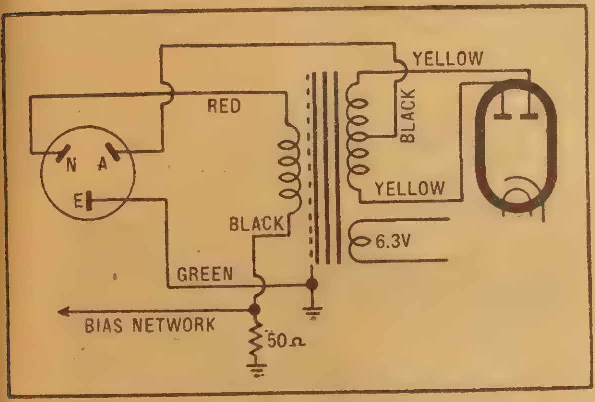
I then began to think of the wrongly connected plug and decided the transformer must be faulty or connected incorrectly. This was further verified when the voltage across the full HT sec. was found to be nil but from each side to chassis a voltage equivalent to the mains voltage was apparent.

Further inspection showed there were two black leads coming out of the transformer windings, one being the HT centre tap and the other one side of the primary winding. It appeared likely that these were reversed and after checking for continuity, this proved to be the case. On connecting these correctly and reconnecting the heater network, the set performed well when switched on again. Plenty of stations and no hum apparent.

Mr. S.G.G. then goes on to offer his explanation of why the set worked for the builder, but not for himself, and, at first glance, the explanation is a very interesting one.

The circuit as the builder made it. As well as transposing the power transformer leads he also transposed the power plug leads. Note that the back bias network was connected in the mains circuit. In a transposed mains socket the chassis would be alive.





After the serviceman had corrected the faulty power plug connection the set would not work due to lack of HT and filament supply. Unlike the previous arrangement it would be safe in any normal power socket.

However, closer study of the problem shows one or two flaws in the argument and suggests a rather less obvious, though more feasible, explanation. At the same time it must be appreciated that in all problems of this kind there is, inevitably, a certain amount of conjecture, since one can never be quite sure which are the active and neutral pins, respectively, of any given power point.

Generally, by the time the fault has been corrected, the only way to check one's theory is to re-create the fault and try the set under identical conditions. Apart from the time involved, no one cares to tempt fate too far by deliberately making potentially dangerous connections to the mains. Thus we are forced to fall back on "theory".

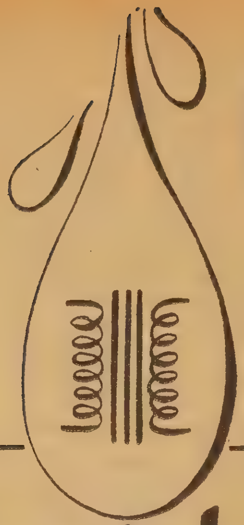
The important point about this case is that the set contained two faults, one being the transposed transformer leads, and the other the transposed power lead connections. (I am skipping the faulty audio connection, since this presents no mystery). With both faults present, the set would either work, in a fashion, or be a potential death trap, depending on the disposition of the active and neutral pins of the power point.

With the power cord correctly connected, the set could still work in one power socket, but not in another, though it would not be particularly dangerous in either. Figure 1 shows my own idea of the conditions prevailing when the owner first tested it.

CHASSIS TO NEUTRAL

It seems reasonable to assume that the green earth wire from the chassis, and which was incorrectly terminated at the power plug, must have finished up connected to the neutral side of the mains. Had it been otherwise, the owner would almost certainly have received a nasty, if not fatal, shock. It is also unlikely that the set would have worked.

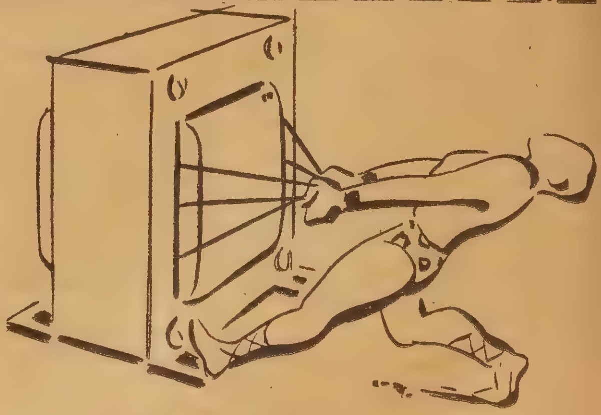
On this assumption, the conditions would be somewhat as follow: One side of the transformer primary (red lead) to the active side of the mains and the other side of the primary to the chassis, via the 50 ohm back bias resistor. Since the chassis was connected to the neutral (earthed) side of the mains through the incorrectly connected green lead, there



Coil Impregnation

The Coil of a National Power Transformer is scientifically impregnated with a special varnish, and baked to resist humidity. This binds the winding into a homogeneous mass and ensures efficient transfer of heat from inner winding to the open air.

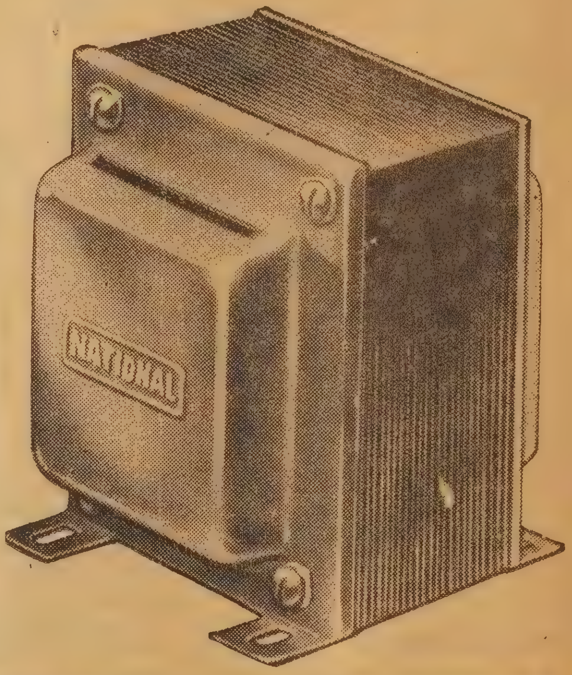
Special Anchoring



National Power Transformers are constructed on sound robust lines. A special feature of this is the exclusive anchoring method used inside the core to prevent the leads being pulled out.

National

POWER TRANSFORMERS



. . . are specially engineered to the high standards demanded by the Australian Radio and Electronics Industry, and are used exclusively by many of the largest radio manufacturers. Almost without exception where a manufacturer does not make his own power transformer, NATIONAL is used, because National has many exclusive features, possesses the utmost in performance, and has a long and continuous reputation for quality.

So next time you buy a power transformer specify NATIONAL, and check the difference. They're cool and quiet, and are available in an unexcelled range of upright and flat types between 30 and 175m. Ask your electrical supplier for full details, or write direct to this Company.

Australian & Overseas Agents:

Wm. J. McLELLAN & Co. Pty. Ltd.

126 SUSSEX STREET, SYDNEY. [illegible]
(50 yards north of King Street)
DISTRIBUTORS IN ALL STATES

A NATIONAL PRODUCT FOR A NATION'S NEEDS

was provided a complete path for the mains current through the transformer primary.

The only snag was that this path included the back bias resistor, which would not only reduce the voltage across the primary winding by several volts, but also "gum up" the bias network by introducing the same number of volts of raw AC into it. No wonder the set hummed!

On the secondary side of the transformer things were more nearly normal. The secondary centre tap, being connected to the earth pin of the power point, would eventually find itself connected to the chassis. This was not quite as originally intended, since the back bias resistor was excluded, but it would allow the set to work.

COULD STILL WORK

It also seemed likely that the set would have functioned in much the same manner had the power plug been correctly connected — provided it was used with the same power point, or one having a similar disposition of the neutral and active pins. This is because the two leads which were transposed, the earth and the neutral, are virtually the same connection.

Figure 2 shows a possible explanation of the conditions after my correspondent had corrected the power cord connection. It also assumes that the active and neutral pins of his power point were transposed, relative to that used by the owner, or that he transposed the mains lead in the act of re-connecting the plug.

Assuming this to be so, the following conditions would apply: The primary winding would now be connected between the neutral and earth pins (still via the back bias resistor) and so would be quite passive. The active pin would connect to the centre tap of the secondary and the mains voltage would appear at each of the rectifier plates, relative to chassis.

At first glance it appears that this would allow the rectifier to operate as a half wave device and the set would perform much as an AC/DC set. This is part of the explanation put up by my correspondent, but it falls down when one realises that there is no provision for heating the rectifier filament.

NO LINES OF FORCE

No current could flow through the secondary windings until the rectifier fuctioned and this could not happen until the heater was energised. But even assuming that current did flow through these windings it would flow through the halves in such a way as to cancel any magetic fields, so that there is no chance that the filament windings could operate.

Apart from the technical points, the obvious comment is that the home builder is fortunate not to have received a shock from his brain-child. Which naturally leads to the question: Was he just careless or did circumstances combine to create a dangerous situation?

Considering the many thousands of sets which have been successfully constructed by home builders and that this is the first case of its kind to be brought to the notice of either Radio and Hobbies or myself, it would seem reasonable to assume that the home set building hobby is just about as safe as any hobby can be. (After all, even golf has its hazards.)

In answer to the second part of the question it can only be regarded as unfortunate that there was combined in this instance a transformer with a color code which could be confused and a home builder who, to be quite frank, seemed somewhat lacking initiative.

I am prompted to say this because, although there were two leads of the same color attached to the transformer, it is usually quite easy to see which leads belong to which winding, if only by the manner in which they are grouped. In any case, one would suppose that the builder, rather than take a chance if there was any doubt, would have sought some assistance to identify the leads. After all, the simplest of continuity checks would be sufficient.

On the other hand, the fact that a mistake was made suggests that the transformer manufacturers might adopt a less ambiguous color code.

Personally, I would prefer to see transformers fitted with terminal panels as they used to be in the old days. Not only was there little doubt about the connections, but the assembly of a set was a great deal easier. Unfortunately, it seems that the present trend of upright transformers makes it uneconomical to fit a satisfactory terminal board, and this trend is not likely to change.

The case also raises the problem of power-point standardisation regarding the neutral and active pins. As far as I can find out, there does not seem to be any attempt at present to establish such a standard, and even if one were created immediately it would be virtually impossible to bring all existing installations into line.

WOULD IT HELP?

Some may argue that there would be very little to be gained by such a move, since a properly wired appliance is safe anyway, and an incorrectly wired one equally unsafe.

On the other hand, the presence of such a system would enable plugs and sockets to be marked on all three connections, rather than the earth only as at present, with the possibility that the amateur would thus have two extra reminders of the correct termination.

So there it is. I don't think that any one group or person is to blame, but rather that there was a combination of several factors to bring about the whole situation. In any case, the moral is clear: Don't monkey with the mains.

SPEAKER BOXES

The very latest in design. Black wrinkled finish.
8in .. 24/-, postage 5/-.

ENAMELLED WIRE

Wound on neat wooden spools. All B & S sizes.

Gauge	100	200	300ft
16	9/6	17/-	25/-
18	6/3	12/-	17/-
20	4/-	7/6	10/-
22	2/9	5/-	7/6
24	2/6	3/4	4/9

26 and 28 same as 24. Add postage.

KAR-SET CASES

Old type, radio case 7 x 6 x 3½ and vibrator case 6 x 5 x 3½, complete with chassis, 43/-. New type, 8½ x 6 x 3½ combined, 37/6 complete with chassis. Add postage.

INSTRUMENT CASES

(with front panel)
"A" 5 x 5 x 4 deep, 15/9
"B" 7 x 6 x 4½ deep, 17/3
"C" 9 x 7 x 5¼ deep, 18/9
Postage extra.

HANDY CABINETS

Every workshop needs a set of these small metal cabinets. Has 16 drawers with provision for fitting identification cards on each drawer. Attractively finished in grey baked enamel. Size 12 x 9 x 5½ deep.
OUR PRICE, 48/6. Postage: Vic., 3/8; other States, 7/-.

METAL CASES

Ventilated type. Black wrinkled finish, loose front panel. Model "A" 11in x 5½in x 7in high. Panel size 9in x 7in to suit chassis 8in x 5in. OUR PRICE 26/9, post extra.

INSTRUMENT CASE

(Lift-up Lid)
15¼ x 7 x 8¼ deep. Suits chassis 11 x 8. PRICE 61/9, add postage.

SHUNTS

10. 25, 50, 100 M/a. 14.8, 166.6 ohms. Tolerance .1%. Price 6/9 each.

ALUMINIUM CHASSIS

All welded ends.

6 x 4 x 2	7/-
8 x 5 x 2½	9/3
10 x 6 x 2½	10/8
11 x 8 x 2½	11/6
13 x 7 x 2½	12/6
17 x 8 x 3	18/9
17 x 10 x 3	19/11

Add postage.

ALUMINIUM PANELS

16 Gauge .050in thick.

6 x 5½	3/-	14 x 8	7/6
9 x 5½	3/3	18 x 9	11/4
11 x 5½	4/6	16 x 12	13/-
7 x 7	3/3	20 x 9	12/3
9 x 8	4/10	24 x 12	19/6
12 x 8	6/6		

Please add postage.

BAKELITE PANELS

Best English, high gloss black.

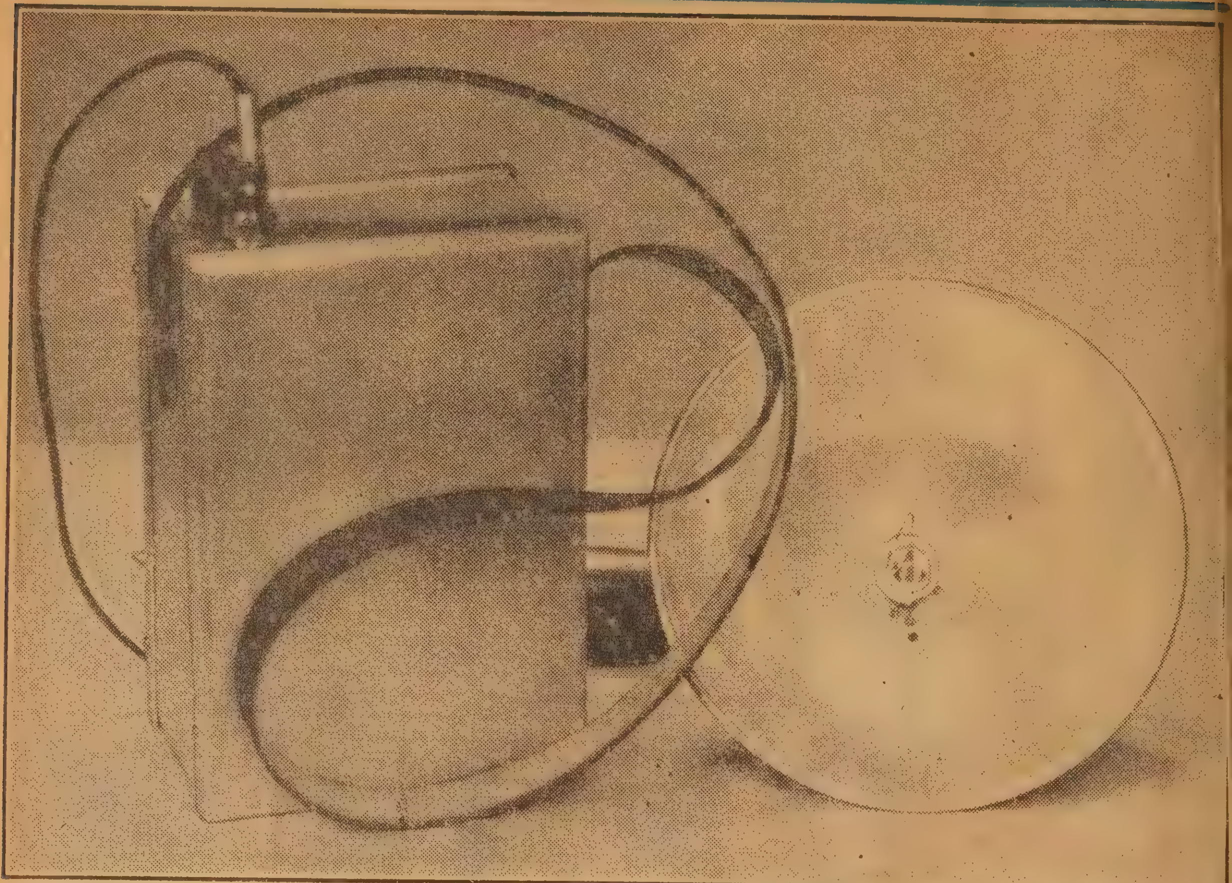
6 x 6	6/-	9 x 8	10/6
7 x 7	7/6	12 x 8	15/9

Add postage.

ALUMINIUM BRACKETS

Three sizes, 2 x 4; 3 x 5; 4 x 6. Our price 3/6 pair.

Radio RSC Supply
COMPANY
BOX 4595 G.P.O. MELBOURNE



A view of the completed unit. The outlet socket may be seen on the left of the case and the selector switch behind it. The body of the gun is just visible between the reflector and the case.

A NEW ELECTRONIC FLASH UNIT

As intimated in previous issues we have been planning a flash unit designed around some of the new low voltage components coming from overseas. Well, here it is. Light in weight, powerful and very flexible in design, it is just the thing photographers have been waiting for.

by Philip Watson

FIRST let us detail briefly the main characteristics of the unit. Our own model weighs 6½lb and consists of an aluminium case measuring 8in x 5in x 4in. The gun is 7½in long, and made from 1 3-8in diameter thin-walled brass tube. These dimensions are such as to make attachment to most cameras extremely simple.

That all-important factor, the joule rating, is 80, and we hasten to emphasise that they are real joules — not the "ersatz" variety dearly beloved by enthusiastic advertising writers.

Other features are simplicity of operation — there is no charging button on the gun and no need for any switching between shots — and a selector switch to give a choice of two ratings. Finally, the design is an extremely flexible one, which may be easily varied to suit either the photographic, or financial requirements of the individual.

Construction of the unit calls for some components outside the normal range of radio components and a few words about them may help.

Obviously the most important item is the tube itself. This is a 250 volt, 100 joule unit, requiring a pulse of 3000 volts applied to the triggering electrode to fire it. The flash duration time is 1-1000th second.

Physically it is a small helix mounted on a SES base with the centre contact as the negative electrode. The positive electrode is a lead wire from the other end of the tube and the triggering electrode a thin wire wound around the outside of the glass tube. The type number is Siemens SF15.

The capacitors are electrolytics, specially developed for electro-flash operation. Each unit is 650 mfd at 250 volts and will store 20 joules of energy. This is a convenient arrangement, since it means that a working unit can be made with only one capacitor, if desired, enabling the home builder to start work with a minimum outlay. The light output, though small, will be useful in a limited way and extra capacitors can be added as convenient.

The trigger transformer was supplied by one of our advertisers, who made it to our specifications. Similar details have been given to other makers who will no doubt submit samples in due course. Actually, a model aircraft ignition coil can also be used.

Both the neon lamp and the reflector are similar to the ones used for our original high-voltage unit.

ıd, in fact, came from the same ippliers. The only difference is that e reflector is not slotted to accom-odate the gun, due to the different ounting of the lamp. Most of the maining components are standard dio types.

Reference to the circuit will show at the main capacitors are charged irectly from a 247.5 volt battery mposed of two 90 volt and one 67.5 olt portable radio batteries. A 250 hm resistor in the charging circuit ffectively isolates the battery from e capacitors as far as the discharge ycle is concerned, but does not seri-usly affect the charging cycle.

HOICE OF RATING

A selector switch is arranged to onnect either two capacitors (40 oules) or four (80 joules), as re-uired, thus providing a choice of ating.

This is an important feature be-ause the maximum light output can ometimes be embarrassingly high hen combined with high sensitivity mulsions, close working conditions, nd a lens with limited small stops t also provides a faster charging time nd a saving in battery drain when onditions justify the lower rating.

An important unit is the 5000 ohm esistor connecting the two capacitor ections to be switched. If this is not sed it is impossible to add an extra apacitor section once the first sec-on has acquired even a small charge

This is because the uncharged sec-ion presents what is virtually a hort circuit to the charged section, nd, since the energy stored is con-iderable, the result is a "splat" that ill send observers ducking for over, to say nothing of the damage hich will be done to the switch ontacts.

As it is, the 5000 ohm resistor tends o even things up and prevent such n occurrence.

HARGING CYCLE

In practice, it means that all capa-itors will be charged, even on the low" setting, so that the first charge vill take the same time as on the high" setting. However, only one ection will be discharged in the sub-equent flash and the energy stored n the remaining section will then low into the discharged section, mak-ng the second and subsequent harges faster.

Although, as shown, the circuit vill halve the light output (a differ-nce of one stop) there is no reason hy it could not be modified to select ither one or four capacitors, thus naking the lower value one quarter f the top value. (Two stops differ-nce.)

This feature is, of course, quite op-ional and can be omitted if preferred n this case the switch would be re-laced by a simple ON-OFF type.

The gun circuit consists of voltage livider, a neon indicator to show vhen the capacitors are charged, and triggering circuit to fire the tube. Since it is likely that individual cir-uits will have to be adjusted to allow or normal manufacturing tolerances of both resistors and neon lamps, it is s well to consider this circuit in ome detail.

The .1 meg resistor marked with n asterisk can be varied from the alue marked to complete removal and is used to control the voltage at which the neon flashes.

Decreasing the value will lower the striking point. At the same time it will increase the voltage developed across the trigger circuit, which is all to the good. On the other hand, if it should appear that a value greater than .1 is required it would be better to decrease the value of the .5 meg slightly in order to avoid any chance of reducing the triggering voltage below a safe value.

STRIKING VOLTAGE

The exact value at which the neon fires is largely a matter of personal choice. By making it strike at the lowest voltage at which the tube will fire consistently (about 190 volts, though variable from tube to tube) the lowest possible end-of-life voltage can be set for the batteries and the charging time is apparently made shorter.

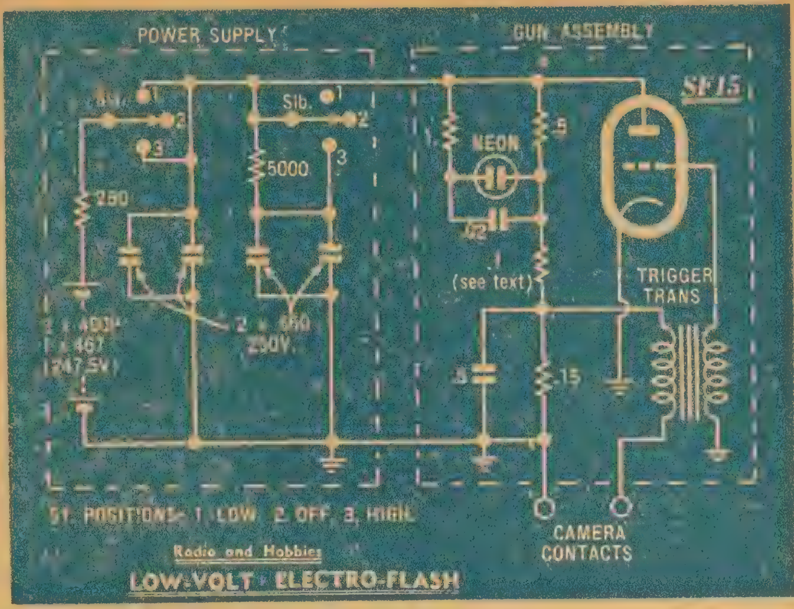
However, this will cause a maximum variation in light output between a flash which is fired immediately the neon strikes and one which is fired several seconds later when the capacitors are fully charged. This can be particularly serious where color work is contemplated.

By making the neon strike later in the charging cycle a more accurate indication is provided and exposures will be more consistent, but care must be taken not to set the voltage so high that a reasonable life cannot be expected from the batteries. A figure of 225 volts will probably be a reasonable compromise in most cases.

FIRING PULSE

The .15 meg resistor should develop sufficient voltage across itself and the .5 mfd capacitor to produce the required peak voltage in the secondary circuit when the primary circuit is closed by the camera contacts

If it is found that triggering is not reliable, this value (.15 meg) may be increased, though it should not be necessary to go beyond about .2 meg. Note that changes in this value may



The circuit is a very simple arrangement and should be quite easy to follow. All the resistors in the gun are half watt types and the two in the power supply one watt types. Note the switching arrangement with the centre position "OFF".

PARTS LIST

1 Aluminium case 8¼in by 5½in by 4in.
4 650 mfd 250 volt electrolytic capacitors.
1 .5 mfd 350 volt paper capacitor.
1 .02 " " " "
1 1 " " "
1 .5 meg. ½W resistor.
1 .15 " " "
1 .1 " " " (See text)
1 5000 ohm 1W resistor.
1 250 " " "
1 250V 100 joule flash tube, SF15 or similar.
1 miniature neon lamp.
2 490P batteries.
1 467 battery.
1 trigger transformer.
1 2 pole 3 position switch (series 20, type 28 or similar).
1 reflector.
Approximately 9in 1⅜in OD 20g brass tube for gun.
1 single contact mic. plug and socket.
4 ft twin plastic flex.
1 grommet ¼in hole.
3 3 terminal tag strips.
1 4 terminal tag strip.
1 8 terminal tag strip.
2 plugs for 490P batteries.
2 fastener clips for 467 battery.
2 pieces of insulating bakelite approx. 3in x 4in.
1 pointer knob.
1 leather strap.
Hook-up wire, nuts and bolts, solder lugs, insulating sleeving, 18g tinned copper wire &c.

"NOVATAPE" EQUIPMENT

gives good musical reproduction of up to

3500 c/s at 1 7-8 inches/sec (4hrs on 1200ft Tape).

A second speed of 3¾ inches/sec. will give a response of 5000 c/sec. sufficient for most applications.

USE "NOVATAPE"
HEADS, KITSETS,
DECKS, AMPLIFIERS
COMPLETE RECORDERS

NEW RELEASE:—

Special Magnetic Heads for

Striped FILM

Special Pick-up Head

FOR TELEPHONE AMPLIFIER

(Feb. 1954) available Mu-Metal, High Gain Coils. Kit of parts, 19/-. **Completely built-up, 27/6.** Relay Switch, 14/6. Cabinets and other parts available.

"PHOTOFLASH"

All parts for the

NEW LOW VOLTAGE

Photoflash outfit described in this issue available from **"NOVA"**

The new type Flashbulb, Reflectors to suit, (double anodized), Case and Gun-handle, Condensers, Neonlamps etc. available separately and in Kit form or completely built-up units.

TRANSFORMERS

From Hearing Aid Transformers to "WILLIAMSONS" and large power transformers. NO JOB TOO SMALL! NO JOB TOO LARGE!

All types of Transformers to our or customers, specifications.

VARIABLE TRANSFORMERS REWINDS

TERMS ON LOW DEPOSIT

For further details contact your dealer or

'NOVA'

311 SUSSEX ST.,
SYDNEY.
M2159 M2350
Open SAT. MORNINGS & WEEKDAY NIGHTS.

CUT OUT HERE

4/54

Please send without further obligation, details of

....

NAME ....

ADDRESS ....

....

I enclose LARGE self-addressed enevlope and 6d in stamps.

LOW VOLTAGE PHOTOFLASH CAPACITORS

T.C.C. LECTROFLASH lightweight electrolytic capacitors are designed for use with the new photoflash tubes operating at reduced voltages.

With the range of capacitor ratings now available, series or parallel combinations may be used to provide the desired light output with any flash tube operating up to 1000 volts.

LECTROFLASH capacitors may be used with dry batteries or rectified AC power supplies. In the latter case, the power supply should be designed so that the rated peak working voltage of the capacitor is not exceeded under any operating conditions, including mains variations. (The "peak working voltage" is the sum of the DC component plus the peak of any ripple voltage.)

Leakage current is less than 1 mA. Capacitance tolerance is minus 20% plus 50%.

TYPE NO.	CAPACITANCE (Mfds.)	PEAK WORKING VOLTS	LENGTH (Inches)	DIAMETER (Inches)	WEIGHT (Ounces)	RETAIL PRICE (Including 16-2/3% Sales Tax)
SCE36PE	120	500	4½	1½	6	28/3
SCE60PE	200	500	4½	1¼	9	32/10
SCE60HE	650	250	4½	1¾	9	40/7
SCE60FE	900	180	4½	1¾	9	44/4

SCE60HE is the correct unit for use in the circuit in "Radio and Hobbies" for April, 1954.

Available from leading suppliers. *Trade inquiries to:—*

UNITED CAPACITOR CO. PTY. LIMITED

433 Punchbowl Road, ENFIELD, N.S.W. LF3511

MELBOURNE: 486 Bourke Street.
ADELAIDE: Stephen & Co., 83 Grenfell Street.
BRISBANE: Tecnico Ltd., 103 Albert Street.
PERTH: O. F. Gamble, 384 Murray Street.

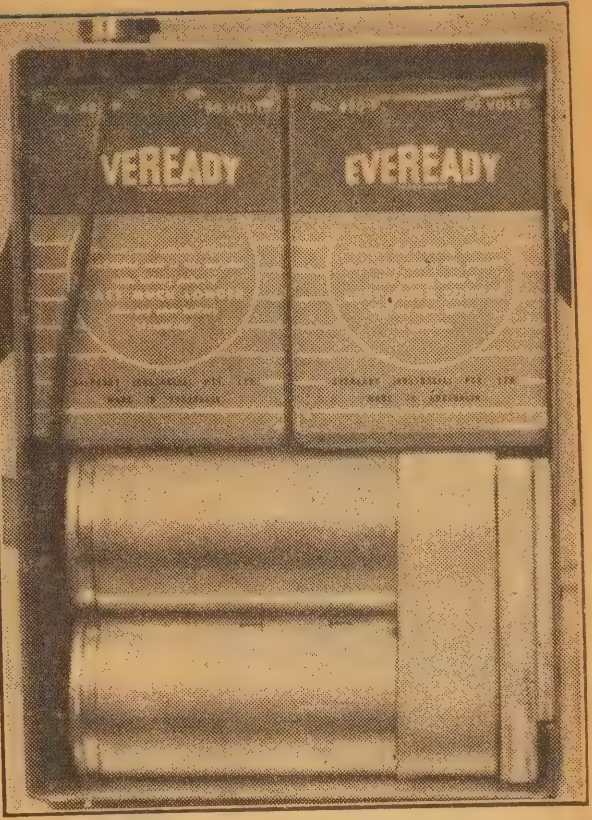
UCC ½P.3

pset the neon circuit and a certain mount of juggling may be necessary. In testing the triggering circuit sevral important points should be noted.

Testing should be carried out with the tube in total darkness (inverting the reflector on the bench will usually suffice) since it can easily happen that a tube will fire consistently under normal lighting but fail in darkness. This is a normal characteristic of all gaseous tubes, the presence of light tending to assist ionisation.

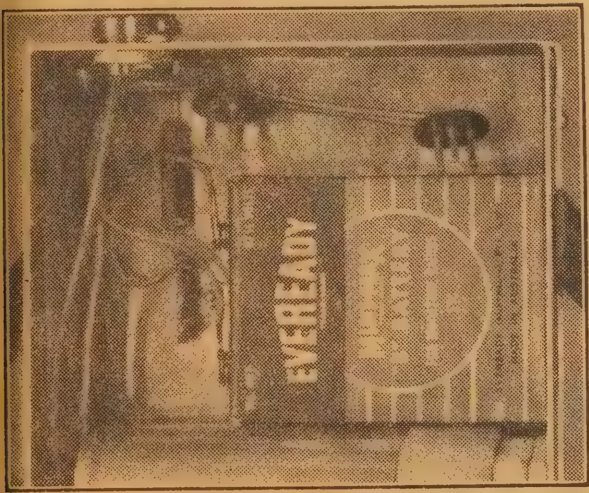
It will also be found that the tube vill fire more easily after the first lash, due to the heating of the gas, vhich also assists ionisation.

To provide the best triggering perormance, it is important that the corect polarity of the trigger transormer be observed. This is to ensure hat the initial pulse will be positiveoing as required to fire the tube. If t is not, the triggering will depend n the oscillation of the circuit to provide a second pulse having the required polarity. Since this will always be of a lower amplitude than the first one. it is less efficient.



An inside view of the case showing arrangement of the batteries and capacitors. The capacitors are held together with rigid wiring between the terminals and a wrapping of tape at the other end. By making the case about ½in higher a fifth capacitor can be accommodated behind the 490P batteries.

☆



A view showing the mounting of the 467 battery. A three terminal tag strip between the terminals holds it in place. It would be moved to the top of the case to accommodate a fifth capacitor.

The best way of checking this is simply to try both connections under the least favorable conditions and observe which gives the best results.

Coming now to the more practical side we will consider the actual construction and the relevant physical characteristics of the various components.

The power supply is housed in an aluminium box and we have arranged with the sheet metal firms to supply these to our blueprints. It is likely that we will specify a case slightly higher than the one we used in order that five capacitors may be used if required. This will store the maximum permissible 100 joules.

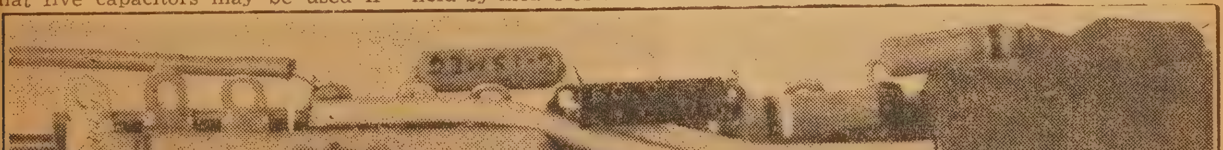
As can be seen from the photograph the capacitors are housed in the lower section of the case, mounted horizontally. All the negative terminals are joined with 18g tinned copper wire, as well as the positive terminals of the two groups. The 5000 ohm resistor is also mounted between the appropriate positive terminals. This is sufficient to hold the units together at this end, and the other end may be held by means of one or two turns of insulation tape or a strap of tinned copper wire.

The active terminals must be protected from the metal case and a square of bakelite or similar material should be inserted between them. A packing piece of plywood should be inserted between the other end of the capacitors and the case to keep everything firm.

The batteries are mounted above the capacitors, the type 467 against the rear of the case and resting on edge. The two type 490P's sit in front of it in an upright position.

Where only four capacitors are used the 467 will be clear of the top of the case but, when five are used, it will be pushed against the inside top of the case to make room for the fifth capacitor. This will lie behind the two 490P's above the main group of four.

The bottom of the 467 battery rests against the right hand side of the case. A small insulated support, resting against the top between the terminals, holds it in place. The support consists of an ordinary three-terminal tag strip and a second similar strip is



The gun assembly ready to slip into the gun tube. On the right is the trigger transformer and above it the 1 meg. neon resistor. To the left is the .5 meg., .1 meg., and .15 meg., in that order. The large capacitor is the .5 mfd and the small one the .02 mfd.

SIEMENS

SIEFLASH TUBES

Have proved invaluable for aerial, colour and high speed photography producing light flashes of high intensity.

SIEMENS SIEFLASH TUBES, TYPE SF.15, *As illustrated:—*

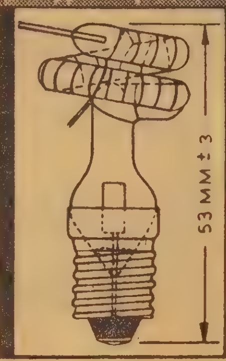
Will give more than 10,000 flashes.

Have maximum output of 100 joules.

Have approximate effective flash duration of 1,000 micro-seconds.

Can be operated from dry batteries.

Other types of Sieflash Tubes available — ask for Sieflash Data Sheet RG.3538/1.



AS USED IN THE EQUIPMENT DESCRIBED IN "RADIO & HOBBIES"

SIEMENS (AUSTRALIA) PTY. LIMITED

SYDNEY, MELBOURNE, ADELAIDE, BRISBANE, NEWCASTLE
H. C. LITTLE & Co., Pty., Ltd., Perth.
W. & G GENDERS Pty., Ltd., Tasmania.

"MAGNEGRAPH" TAPE DECKS

Manufactured by Boose Hawkes Ltd., England

★ The "Magnegraph" Tape Deck is a precision mechanism, and when used in conjunction with a suitable amplifier it provides faultless recordings and playback of music and speech.

★ The "Magnegraph" has a recording time of 70 minutes per loading, made possible by the use of a twin recording head.

★ A direct reading calibrated scale shows the exact amount of tape that has been used. A fast rewind speed enables the user to run back to any portion of the tape in a matter of seconds.

★ The top panel of the "Magnegraph" Tape Deck has a baked enamel cream finish, which is handsomely engraved in red. Provision has been made on the top panel to mount the record/play switch, volume control input and output jacks.

★ The "Magnegraph" deck is supplied ready to operate, and is complete in every detail, including—main control switch and knob, level indicator, mains indicator. A schematic circuit of the "Magnegraph" amplifier is supplied which includes chassis layout, etc.

PRICE **£31/10/-**
(inc. Sales Tax)

Demonstrations and amplifier kit sets available at

EXCELTRON RADIO CO.—BU5412

Cnr. OXFORD and COLLEGE STREETS, SYDNEY

AUSTRALIAN AGENTS: T. H. MAY & CO. PTY. LTD., 16 YOUNG ST., SYDNEY. BU5412.

nted by the same bolt facing the osite direction. This provides an hor point for the 250 ohm limiting stor.

onnection to the batteries is made means of the appropriate fasteners r the 467) and plugs (for the P's). The latter will clear the top the case quite easily but it is adible to fit a sheet of insulating terial inside the case to avoid posle shorting of the batteries if the e should be inverted.

The switch is a simple two-pole, ee-position type and should be so unted as to be clear of the 467 tery, if this should be mounted inst the top of the case.

The outlet socket is a simple unit ginally intended for microphone cuits. It has a single insulated cenl contact, the other connection be through the frame. Some varieties these have a serrated edge on that rtion intended to mount in the nel hole. If the hole is a neat fit ese serrations will bite into the etal and eliminate the risk of twistg.

IRING

There is not a great deal of wiring thin the unit and the circuit is ite simple. Those wires which rry only the charging current can hook-up wire, but something a tle heavier is desirable for the disarge circuit. We used twin plastic x which had been divided where cessary.

Twin plastic flex was also used to nnect the power supply to the gun d this lead should be kept as short possible consistent with reasonable nvenience. About three feet should sufficient in most cases. When fitng this lead make sure that correct larity is observed in the gun and, if cessary, check with an ohmmeter.

A good idea of the assembly of the n components can be obtained from e photograph. To hold the componnts, three tag strips are used; a three, ght, and four-terminal type mountd in that order. These are mounted, turn, on a strip of metal 6in long nd 3-8in wide and having a mountg hole at each end by means of hich it may be fastened to the inide of the gun.

The trigger transformer is mountd at one end of the assembly against he four-terminal tag strip. In order o keep this unit approximately cenral the tag strip should be bent outvards from its normally upright osition to an angle of about 45 derees. The transformer is held in lace with a turn of insulation tape.

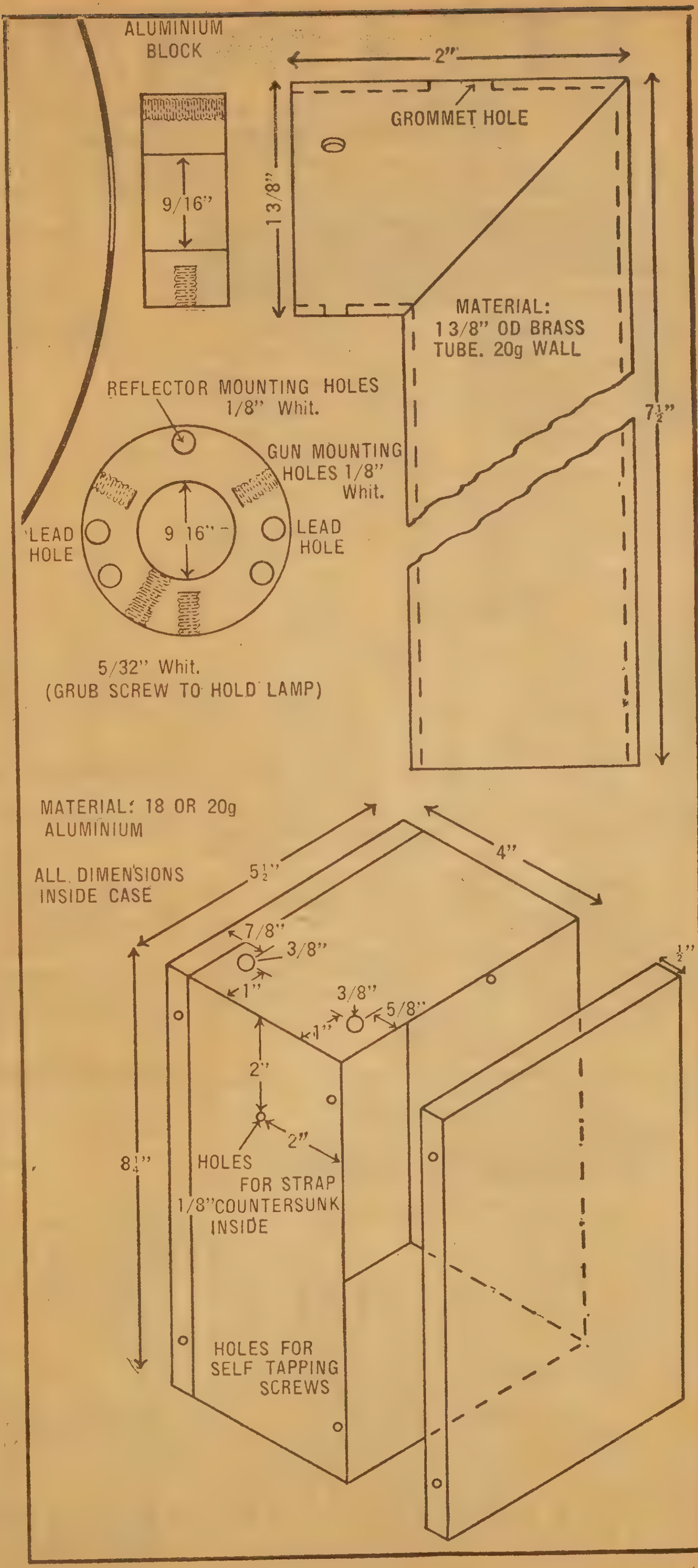
HORTED TURN

Don't be tempted to use a metal trap or loop of wire, since this will ct as a shorted turn and seriously educe the efficiency of the transormer.

It may happen that the transformer you buy will be longer and thinner than the one we used and this should make it a little easier to mount. The only point to be observed is that the metal mounting strip will need to be about three-quarters of an inch longer. There should be plenty of space inside the gun to house any reasonable size and shape of transformer.

The four terminal strip also provides an earth connection for one side of the transformer secondary as well as an anchor point for one end of the 1 meg neon resistor.

The remaining resistors are mounted on the eight terminal strip in the order they appear in the circuit, the

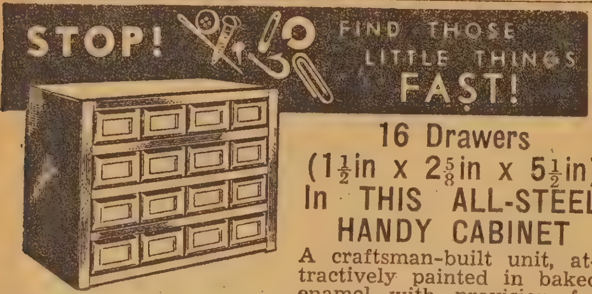

ALUMINIUM BLOCK
9/16"
2"
GROMMET HOLE
1 3/8"
MATERIAL: 1 3/8" OD BRASS TUBE. 20g WALL
7½"
REFLECTOR MOUNTING HOLES 1/8" Whit.
GUN MOUNTING HOLES 1/8" Whit.
LEAD HOLE
9/16"
LEAD HOLE
5/32" Whit. (GRUB SCREW TO HOLD LAMP)
MATERIAL: 18 OR 20g ALUMINIUM
ALL DIMENSIONS INSIDE CASE
5½"
4"
7/8"
3/8"
1"
3/8"
5/8"
1"
½"
2"
2"
8¼"
HOLES FOR STRAP 1/8" COUNTERSUNK INSIDE
HOLES FOR SELF TAPPING SCREWS

COLLINS RADIO

— for Mail Orders with Safe Swift Service —

409 Lonsdale Street, Melbourne, C.1., MU1033

All lines shown on this page (except 16-drawer cabinet) are sent Post Free at prices quoted, For registered post send 1/- ext If you require goods by air freight, please note this on your order and they will be sent freight forward. To save delay, ple remit exact amount of money with your order, giving brief description of goods and PART NUMBER. Sorry, no C.O.


STOP!
FIND THOSE LITTLE THINGS FAST!

16 Drawers (1½in x 2⅝in x 5½in) In THIS ALL-STEEL HANDY CABINET

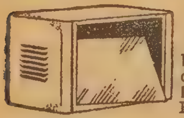
A craftsman-built unit, attractively painted in baked enamel with provision for fitting identification card on each drawer. A strong and most useful cabinet for holding small parts or tools. Ideal for mechanic, engineer, garage or home workshop. Provision is made for stacking into units.
OVERALL SIZE 11¾in. WIDE, 9in. HIGH, 5½in. DEEP. **48/-**
Postage: Vic., 3/8; N.S.W., A.C.T., S.A., Tas., 6/-; Qld., W.A., N.T., 8/4.

VALVES

We have the largest range of Valves in Australia. For any not listed here, use our Fast Quote Service.

				6BW6	19/-
				6J6	27/6
				6K8GT	28/9
				6M5	19/-
				6N8	20/-
				6SN7	26/3
				6V4	15/6
				6X4	15/6
6AB7	26/3	6AU6	19/9	12AT7	32/6
6AC5G	25/9	6AV6	17/-	12AU7	24/3
6AB5	18/6	6BA6	19/6	12AX7	26/3
6AD8	20/-	6BD7	17/-	12BA6	22/3
6AE8	21/9	6BE6	19/9	12BE6	22/6
6AG7	27/-	6BH5	19/6	50B5	20/-
6AN7	21/9	6BR7	30/6	50C5	22/6
6AQ5	19/-	6BV7	19/6	117Z6GT	23/3

INSTRUMENT and AMPLIFIER CASES



Receiver type, vented, takes 8in. x 5in. chassis, with removable front panel as illustrated. Inside height, 6in. Steel, black krinkle finish. Front rounded corners.
Part No. 4C12, 31/6. Post Free.
For any other type or size, use our FAST QUOTE SERVICE

SQUARE STEEL CASE CASES **Square Corners, No Louvres.**

9in. x 7in. x 5½in. deep.	Part No. 4D2	20/6
7in. x 5in. x 4½in. deep.	Part No. 4D3	18/6
5in. x 5in. x 4in. deep.	Part No. 4D4	17/6

Post Free.

PRICE REDUCED!

GERMANIUM DIODES

Direct from England

Type 4A 42 .. .. only

Special shipment just landed. Highest Quality Germanium Diodes . . . positively the finest crystal detector available. Collins Radio are glad to be able to offer these up-to-date products at the new low price.

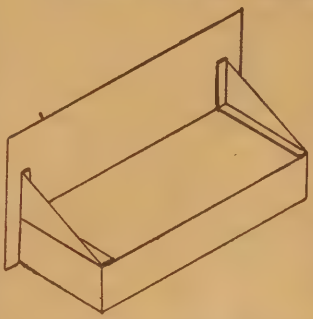
10/-
POST FREE

FAST QUOTE SERVICE

For quickest possible service, write on the left-hand side of a sheet of paper the radio parts that interest you—one beneath the other. If a kit, itemise. Add your name and address and send it to us with a stamped, self-addressed envelope. We will add the latest prices and return to you. Use this sheet as your order form and return to us with remittance for cost and postage as quoted. Goods will be sent same day. Any surplus refunded. Sorry, no C.O.D.

Here's a NEW SERVICE for Home Constructors

COLRAD CHASSIS-PAK



All aluminium. Chass only, panels only, chass and panels, or Chassis-Pa complete with chassi panel and brackets will l sent Post Free same da as order at prices marke below. Brackets are n supplied separately.

Chassis Only Post Free	Price	Panels Only Post Free	Price	Bracket Size	Chassis Pak Post fre
6" x 4" x 2"	7/6	7" x 5"	2/3	3" x 3"	12/-
8" x 5" x 2½"	10/-	9" x 7"	3/9	4" x 4"	16/-
10" x 6" x 2½"	12/-	11" x 9"	6/3	5" x 5"	21/-
11" x 8" x 2½"	14/-	13" x 9"	7/3	5" x 5"	24/-
13" x 7" x 2½"	14/-	15" x 9"	8/6	5" x 5"	25/-
13" x 10" x 2½"	17/6	15" x 9"	8/6	5" x 5"	28/6
17" x 8" x 3"	22/6	19" x 12"	13/9	7" x 7"	40/-
17" x 10" x 3"	24/6	19" x 12"	13/9	7" x 7"	42/-
17" x 12" x 3"	26/6	19" x 12"	13/9	7" x 7"	44/-

All unblemished Bright Aluminium

order Colrad Chassis--Pak by chassis size only

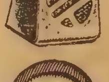
AT5 AERIAL COUPLING UNIT

Contains high-grade 2in moving coil meter (with external R. thermocouple), 1-gang 450 pf condenser, H.D. enclosed relay selector switches, coils, capacitors, knobs, many useful part In metal case 11in x 13in x 10in. Sent freight (20lb) forward. Part No. 4D43 ... ... **35/**

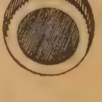
R.A.A.F. CRYSTAL HOLDER TYPE DC 11-C

¾in pin centres, with ¾in square, ground mount plates.
Part No. 4D48 .... **9/**
(Trade inquiries invited.)

SPEAKER BOXES



12in. particularly handsome case, tastefully covere in two-tone leatherette, strongly constructed o wood. Sloping-front type, suitable for portabl public address system or good-looking extensio speaker.
Part No. 4D46 .... **55/**
Postage: Vic., 2/11; N.S.W., A.C.T., S.A., Tas., 4/ Qld., W.A., N.T., 6/-.



8in. metal, round, suitable car radio or home exten sion speaker. Choice of Green, Cream, Blue Pastel finish. Post Free. Part No. 4D45. .... **22/**

HIGH GRADE METERS

Brand new, high-grade, 2¼in. squar jewelled movement meters. Calibrate 0-20 volt on .5 MA movement, wit internal multiplier. In Original pack aging. Part No. 4D44. Post Free.

19/6

All other types available. Use our Fas Quote Service.

meg being nearest the trigger trans- ormer. The last terminal on this rip is the active lead to the camera ontact.

The three-terminal strip simply rovides an earth connection for the capacitor.

If properly constructed the whole ssembly should slide easily into a ength of 1 3-8 inch OD brass tube vith a wall thickness up to 18g, lthough a thinner wall is to be referred.

In our case there was no need for nsulation inside the tube since everything was rigidly mounted and lear of the walls. However, if it should be felt that insulation is desirable, this can be provided most conveniently by means of a piece of sheet plastic such as is available in chain stores for food wrapping.

The flash tube is fitted with small Edison screw base, but we decided against using the appropriate socket mainly because supplies are not very plentiful. Instead, we used a block of aluminium about half an inch thick and turned down to a diameter which was a neat fit inside the brass tube. Through the centre was drilled a 9-16th hole to take the base of the lamp and a hole was drilled and tapped to take a grub screw to hold the lamp in place.

GUN CONSTRUCTION

For the gun proper a length of brass tube at least 9½ inches long is required, though an extra inch or so is advisable to cope with small errors. This is bent over at the top, as shown in the accompanying sketch, to accommodate the base of the reflector and lamp-holder. The bend may be made in two ways: One is to cut through the tube at an angle of 45 degrees, then turn one piece through 180 degrees to make a right angle when the two pieces are joined. The other (which we used) is to cut out a "V" shaped portion having a 90 degree angle, being careful not to cut right through the tube. The top portion may now be bent over and the joint soldered.

The neon indicator is fitted to the top portion, being held in a rubber grommet. The diameter of the tube is approximately a quarter of an inch and a grommet having this diameter hole should be selected.

A short length of tinned copper wire is used to connect the centre contact of the lamp base (cathode) to the aluminium block, the frame of the gun representing the negative side of the circuit. Since aluminium cannot be soldered, a hole must be drilled and tapped to take a screw.

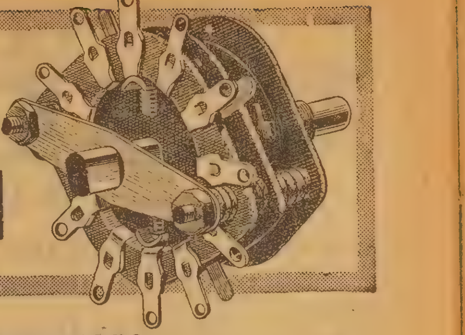
TUBE CONNECTIONS

The other two connections to the tube (the anode and the trigger electrode) are in the form of flexible leads which pass through two holes in the aluminium block. The existing lead from the trigger electrode can be cut off about half an inch from the glass and the lead from the gun soldered to it after assembly.

Connection to the anode was not quite so easy in our case since the wire from the tube cannot be soldered. It also has to be bent at right angles a short distance from the glass and extreme care must be exercised to avoid damage to the seal. However, ours was only a sample tube and we understand that the shipment now on its way from England has

(Continued on Page 111)

PALEC
Rotary 10 Amp.
SWITCH
(Pat. App. 15243/53)



SPECIFICATIONS

MAX. OPERATING POTENTIAL —1,000 V.
CONTACT RESISTANCE—800 Micro-Ohms.
TEMP. RISE ON CONTACTS:—
(with 10 Amp. Conductors)
at 10 Amperes 10° rise
at 20 " 30° "
at 30 " 50° "
BREAKDOWN VOLTAGE:—
A. Between adj. contacts, 3,000 V.
B. Contacts to earth, 3,000 V.
C. Between O/c. contacts, 3,000 V.

RATING—10 Amp., 250 V.A.C.
CONTACTS: Silver-plated copper. Non-shorting only.
DECKS—
1 Pole—max. 12 contacts per deck
2 Pole— " 6 " " "
4 Pole— " 3 " " "
(Special switches to order.)
PRICES (with Standard Clicker)
from: Single Deck—10/- ea.
Extra Decks—5/- ea.
plus 12½% Sales Tax. Subject to alteration without notice.
Available all leading wholesalers.

Quantity prices on application to:

Palec PATON Electrical PTY. LTD.
90-94 VICTORIA ST., ASHFIELD, SYDNEY. UA5266

FINISH YOUR OWN FILMS
with the
KODAK
PHOTO-FINISHING
KIT

The Kodak Photo-Finishing Kit contains all the materials required for home developing of your Kodak Films. This kit is unique in that the strong, all moulded plastic base and lid actually become the processing trays.

Start now to double your picture pleasure—invest in a Kodak Photo-Finishing Kit and enjoy the real thrill of picture-making.

KODAK (Australasia) Pty. Ltd.
Branches in all States

KODAK DEALERS EVERYWHERE

A.C.E. Amplification Communication Electronics

RADIO

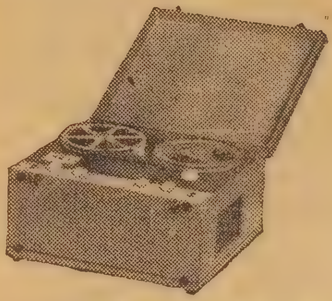
PHONE: LA 3845

136 VICTORIA R'D. MARRICKVILLE, SYDNEY, N·S·W

EVENINGS & WEEKENDS: "KALUA", COLLAROY ST., COLLAROY — XW5956

DULWICH HILL, UNDERCLIFFE, EARLWOOD, TRAM AT DOOR. STOP NO. 42.

TAPE RECORDER by A.C.E.



Features a 1954 Recorder should have

FAST FORWARD	FAST REWIND
3 MOTORS	2 SPEED 7½ & 3½
PUBLIC ADDRESS FACILITIES	PROVISION FOR TUNER
RECORD LEVEL INDICATOR	BASS & TREBLE CORRECTION
MAGNETIC BRAKES	ELECTRONIC ERASE
EXTERNAL SPEAKER OUTLET	MIKE, PICKUP & RADIO INPUT
HIGH FIDELITY HEADS	OPERATE IN ANY POSITION
SIMPLICITY OF OPERATION	GUARANTEE

All This and More in A.C.E.

£84/17/6

Complete with crystal mike, tape and ready for work.

TUNER UNIT, £12/17/6

SCOTCH BOY TAPE

£2/17/6

COLLARO MOTORS

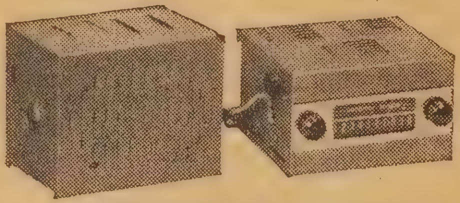
FOR THAT TAPE DECK

£2/12/6

RECORD & ERASE HEADS

HIGH IMPEDANCE
HIGH OUTPUT
HIGH FIDELITY

£3/17/6



KAR SETS

£27/10/0

A FULL RANGE OF CAR RADIOS TO SUIT ALL PURSES AND PURPOSES. Outstanding performance. Simple installation. Complete with aerial to suit you. Side, windscreen or cowl mounting. All installation, accessories guaranteed.

5 VALVE	£27/10/-	5 VALVE A.C. OR 6 OR 12 VOLT UNIVERSAL	£32/2/6
6 VALVE	£31/10/-	6 VALVE UNIVERSAL	£36/12/6
8 VALVE	£41/10/-		

Also the amazing new dry battery Portable and Car Radio. 5 valve £27/10/-.

AMPLIFIERS

£12/19/6

240V A.C. only

7 Valve 10 watt	£12/19/6
7 Valve 25 watt	£22/17/6
7 Valve 40 watt	£29/17/6

240V AC HI-FI, PA Amplifier 7 Valve, 20 watt output, inputs for HI Microphone and crystal P.U. infinitely variable bass and treble boost 18 DB. Ideal for PA or Tape Recordings.

£26/17/6

Battery only

5 Valve 10 watt 6v	£15/17/6
7 Valve 12 watt 12v	£17/17/6
7 Valve 25 watt 12v	£22/17/6

12v Battery & 240v A.C.

7 Valve 12 watt	£19/17/6
7 Valve 25 watt	£26/17/6

ACCESSORIES
MICROPHONES, SPEAKERS, EQUIPMENT AT LOWEST PRICES
GRAMO UNITS, RECORDING

A.C.E. RADIO

Amplification Communication Electronics

PHONE LA 3845

136 VICTORIA R'D. MARRICKVILLE. SYDNEY, N.S.W.

EVENINGS and WEEKENDS: "KALUA," COLLAROY ST., COLLAROY — XW5956
DULWICH HILL, UNDERCLIFFE, EARLWOOD TRAM AT DOOR. STOP No. 42

AR8 Communications Receiver

6-band 140 to 20 megs 11 valve. Standard octal series. Complete with valves and circuit.

£23-17-6

Completely converted for 240v A.C. operation including power supply, speaker & speaker cabinet.

£34-17-6

COMPASS SPIRIT FILLED 4in NAVIGATION UNITS

New Precision Units **17/6**

Postage N.S.W. 3/-, Interstate 5/-

New Coils & Intermediates standard or miniature to suit all valves.

Coils B/C 455 KC	7/6
Coils S/W 455 KC	7/6
Inters	9/6
Loop aerial coils	7/6
BFO units & 1500 KC IFs	12/6

CONDENSERS

ASSORTED MICA & PAPER
WELL-KNOWN BRANDS
75 P.F. to .25 U.F.

15/- PER 100

SCR 522 Transceiver. New condition 17 valve 100 to 150 megs. including Photostat of circuit .. **£24-10-0**

NEW TELEPHONE WIRE

American 7 Strand Rubber Insulated

½ MILE DRUMS **£1-15-0**

CASE OF 6 DRUMS, 3 MILE, £10/-/-

TRANSMITTING CRYSTALS

.01% 2-8 mcs	£3/15/-
100 Kcs (RCA)	£5/5/-
1000 Kcs	£1/7/6

I.R.C. WIRE WOUND RESISTORS

20 WATTS 25, 36, 50, 10000 OHMS
40 WATTS 850, 6000 OHMS 2/6 EACH
IRC 1% WIREWOUND RESISTORS 20K, 30K, 50K, .1m, .15m, .2m, .25m, .5m, 1.0m. .. .. .. **7/6 each**

GENEMOTOR OF MANY USES

Converts to 1/6th H.P. A.C. motor drives as 6v 20amp or 12v 13amp generator converts to A.C. rotary convertor .. **£2-17-6**

MOTOR START CAPACITORS

60UF, 240V, 50cs
20 Starts per hour, 3 secs duration

£1/5/0

TELEPHONE LINE TEST UNITS

5 M.A. meter shunted to 50 M.A.

In carrying case **£1-0-0**

OILFILLED CONDENSERS

8UF 500V — — 10/-. 4UF 400V — — 6/6
4UF 500V — — 7/6. 1UF 600V — — 6/6
8 & 5UF 500V — 10/-. .25UF 3000V 6/6
Assorted 200V rating up to 4UF, 10/- doz.

Micro Switches (American)	2/6
Co-ax. Twin Cable, 20ft Lengths	8/-
Throat Mikes New	3/6
Mike Transformers	4/6
12v 420 Watt Prefocus Globes	7/6
Multi-Core, 7-core	1/- yd.
100yds "	£2/17/6
Multi-Core, 5-core	1/- yd.
100yds "	£2/17/6
Changeover Relay, D.P.D.T. Shielded	18/6
101 or F.S.6 7-Pin Plugs & Cables	7/6
200 Ohm Relays	5/6
Butterfly Condensers 10x60	7/6
12v 50amp Contacters	10/-
FN Midget 2 Gang Condensers	6/9
AWA 6V Gasfilled Vibrators	15/-
Octal Sockets	Doz. 5/-
Hydrometers. Battery testers	5/9
Torches, 3-cell Focusing	9/9
Torches, 2-cell Focusing	6/9

RESISTORS

New; famous maker
100 ASSORTED—over 30 values
50 1 watt, 25 ½ watt, 25 ¼ watt

12/6

Command Transmitters

Transmitters & receivers complete with valves

£6-17-6 ea.

Hi Power Genemotors

6V—500V, 160MA
12V—550V, 350MA

£6/10/-

NEW VALVES

5Y3	10/-	812	£3
EZ82-6V4	10/-	12H6	7/6
7193	7/6	9004	10/-
6H6	7/6	6SK7	12/6
6SH7	7/6	6SQ7	12/6
813	£3	6SA7	12/6
807	£1	6U7	12/6
12SH7	7/6	954	10/-
12A6	12/6	1625	£1
12SL7	12/6	843	£1/10/-
12SJ7	12/6	803	£3
12SK7	12/6	837	£1/1/-
9001	10/-	6J6	15/-
6SN7	12/6	6AK5	15/-
6C4	12/6	6AG7	15/-
6AG5	12/6	807	20/-
6K7	9/6	866	20/-
1K5	3/6	VR150/30	15/-
VR65A	3/6	954	10/-
957	10/-	VR75/30	15/-
1P5	12/6	VR105/30	15/-
6L6	£1	2050	20/-

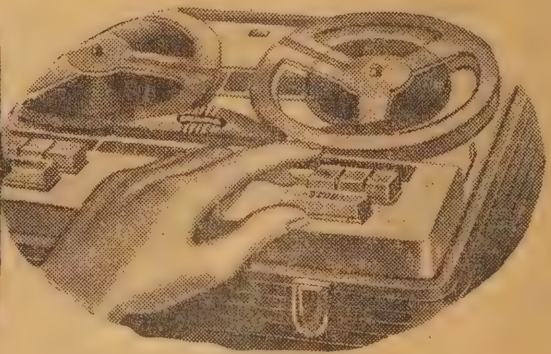
GRUNDIG

GRUNDIG

TWO SPEED "Reporter"

The World's Finest Tape Recorder!

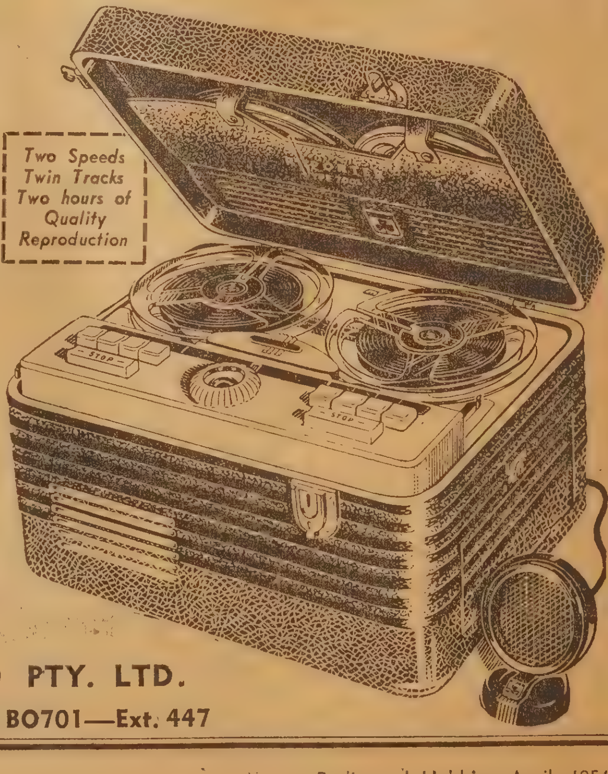
brings you the magic of PRESS BUTTON CONTROL!



✱ **Exclusive "Grundig" Press Button Control is so magically simple, so quickly efficient, that you obtain at the touch of a button instant mastery of both perfect recording and perfect reproduction! Not only this, but two continuous hours of recorded music or speech on every reel, plus features and performance no other instrument can offer! No wonder "Grundig" swept the market overseas . . . is now first choice of world-famous musicians, professional and business men, lecturers, radio and stage artists!**

NO OTHER TAPE RECORDER can give you all these necessary features!

- TWO SPEEDS: TWIN TRACKS!
  1 hour (at 7½in per second) for high-fidelity music of broadcasting studio standard of reproduction.
  2 Hours (at 3¾in per second) of faithful distortionless speech reproduction, or 2 hours of music of normal reproduction quality!
- LIFE-LIKE SOUND. Frequency range 50-10,000 c.p.s. on high fidelity 7½in per sec. speed 50-6000 c.p.s. (3¾in per sec. speed).
- PUSH BUTTON CONTROL. Utter simplicity of operation makes anyone an expert immediately!
- "MAGIC-EYE" RECORDING LEVEL INDICATOR.
- TONE CONTROL FOR TREBLE AND BASS EMPHASIS.
- FAST FORWARD AND REWIND. No tedious waiting.
- CONNECTIONS for recording from: ● RADIO ● RADIOGRAM PICK-UP ● REMOTE CONTROL — AND FOR PLAYING THROUGH: Additional Amplifiers, Radio Sets, Public Address Systems, Earphones, Extension Speakers.
- UNIQUE CONDENSER MICROPHONE faithfully collects every sound, the subtle characteristics of every voice and each note of music.



Two Speeds
Twin Tracks
Two hours of
Quality
Reproduction

RETAIL PRICE **150gns.**

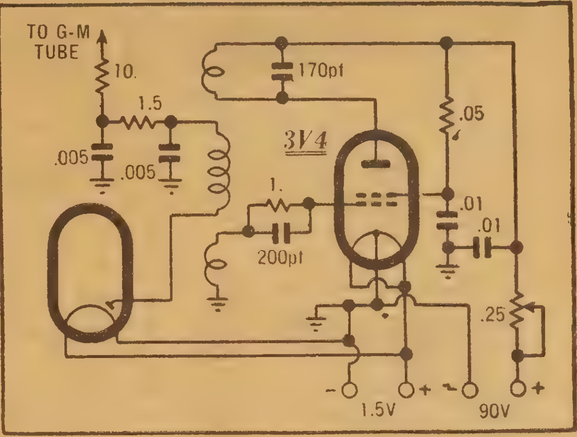
Australian Agents:

GOLDRING ENGINEERING (AUST.) PTY. LTD.

57 H.E. AREA, ST. MARYS, NSW. 'PHONE BO701—Ext. 447

RF SUPPLIES FOR G-M COUNTERS

lsewhere in the issue we describe the construction of a complete Geiger-Muller counter. Here are a few additional notes on R.F. supplies for Geiger counters, which may assist readers who are keen to experiment along these lines.



A typical RF power supply using a 3V4 and the type of coil at present available on the local market. The circuit is readily adaptable to the design on page 28.

URING the development of the instrument, in the "mock-up" ge, we investigated the use of RF power supply with a view establishing its merits relative the pulse type, as ultimately em-oyed.

Owing to lack of time, we were t able by any means to exhaust e possibilities of the RF supply d improved results could doubt-ss be obtained by the develop-ent of an RF coil especially for e job.

The only coil available for our itial experiments was one origin-ly intended for use with a 6V6 similar valve, under maximum erating conditions and providing H.T. for an oscilloscope.

DEQUATE VOLTAGE

Used with a 3V4 at 90 volts, this il produced upwards of 500 volts rectified DC from the diode of 1S5. A suitable circuit arrange-ent is shown, though it must be ressed that the values are typical nly and not necessarily optimum.

The ultimate output voltage is kely to be influenced a good deal y the L/C ratio of the tuned rcuits, the grid capacitor and re-stor and also the possible losses ue to the proximity of the coil other components and to shield-g.

The same factors will influence lso the efficiency—in other words, e ratio of E.H.T. output to B-attery drain.

In an experimental set-up, no reat difficulty was experienced in btaining enough volts to operate e Mullard MX103 tube, using a 0-volt supply to the 3V4 and at current drain of between 3 and 5 illiamps.

Indications were, however, that uch more careful design would e necessary to obtain substantially higher voltage than this, as required by most other types of GM tube.

Where only 500-odd volts is required, it is possible to operate the 3V4 with only half of the filament active, thereby saving on A-battery current by reducing its tolerance to ageing batteries.

Whether one or both filaments should be used depends largely on battery replacement problems.

The circuit will operate also with the valve connected as a triode, but the pentode connection appears to give somewhat better overall results.

While considering RF power supplies, we were attracted by the possibilities of using a 1S5 as the oscillator, feeding the output to its own diode for rectification.

POOR OSCILLATOR

A test, however, indicated that the 1S5 would be hard put to it to give sufficient volts, its performance being nothing like that of the 3V4 with only half the filament operating. This was exactly parallel to our observations of the same valve as a pulse amplifier.

Despite this, however, the valve might yield to persuasion in the form of a more closely coupled coil.

Use of an RF oscillator leads to yet another interesting possibility, namely, the use of the same valve to amplify the count pulses from the GM tube.

Provided the valve is oscillating well above the audio range, the phones can be connected into its plate circuit without any audible note becoming apparent.

If the grid circuit impedance is then kept high enough, and care taken with the layout, pulses from the GM tube can be fed to the grid, producing a click in the phones in the usual way.

The gain is somewhat lower than with separate valves but still adequate for most purposes.

A 1-valve GM counter could certainly be built around a 3V4 or similar valve, except for the difficulty of providing a suitable rectifier. Obviously, if a regular diode is used, it might just as well be part of a 1S5 and no real advantage would be gained.

However, it obviously follows that if a 1S5 could itself be made to function as an RF generator, it could also be made to serve as a rectifier and audio pulse amplifier along the lines indicated in the accompanying circuit.

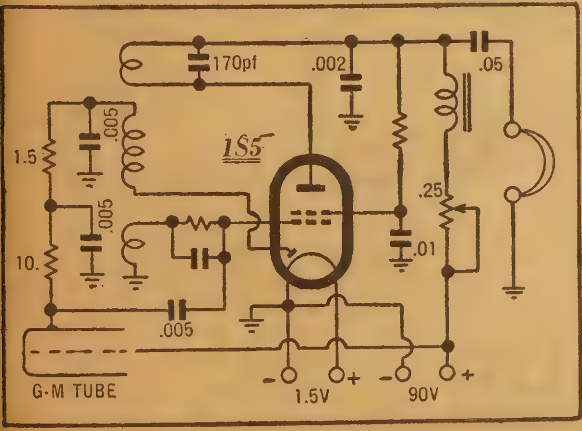
MIGHT BE POSSIBLE

The prospect of such a simple 1-valve counter represents an intriguing challenge to the keen experimenter.

It appears at this stage that a thermionic diode must be used as a rectifier. Triggered gaseous rectifiers, as used in some overseas counters, do not appear to be available locally, while metallic types would most likely have too low a reverse resistance to be used in a circuit of such high impedance.

Our preference for the pulse type supply was based largely on its very low current drain which would allow the HT batteries to operate for almost their entire shelf life.

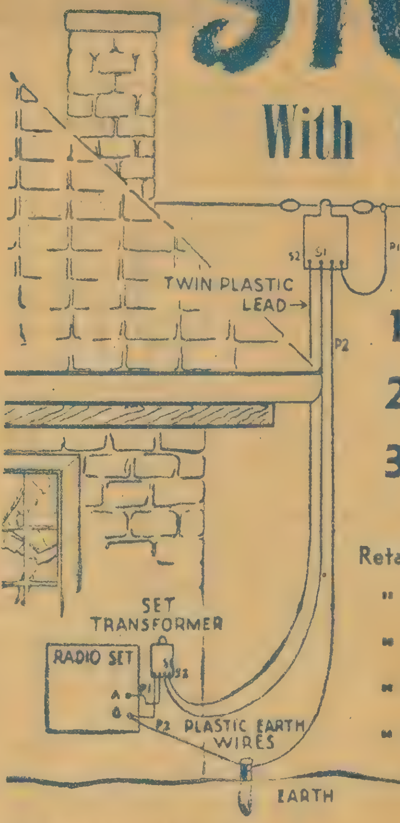
Furthermore, there was a promise of a large margin of safety with failing batteries—another advantage that would most likely not be shared by the RF type supply.



A one-valve G-M counter using a 1S5 is an interesting possibility, though there will be difficulty in obtaining an adequate EHT output. Performance otherwise would be usable though below that of a regular 2-valve version.

STOP NOISE IN YOU SET

With R.C.S. aerial and line filters



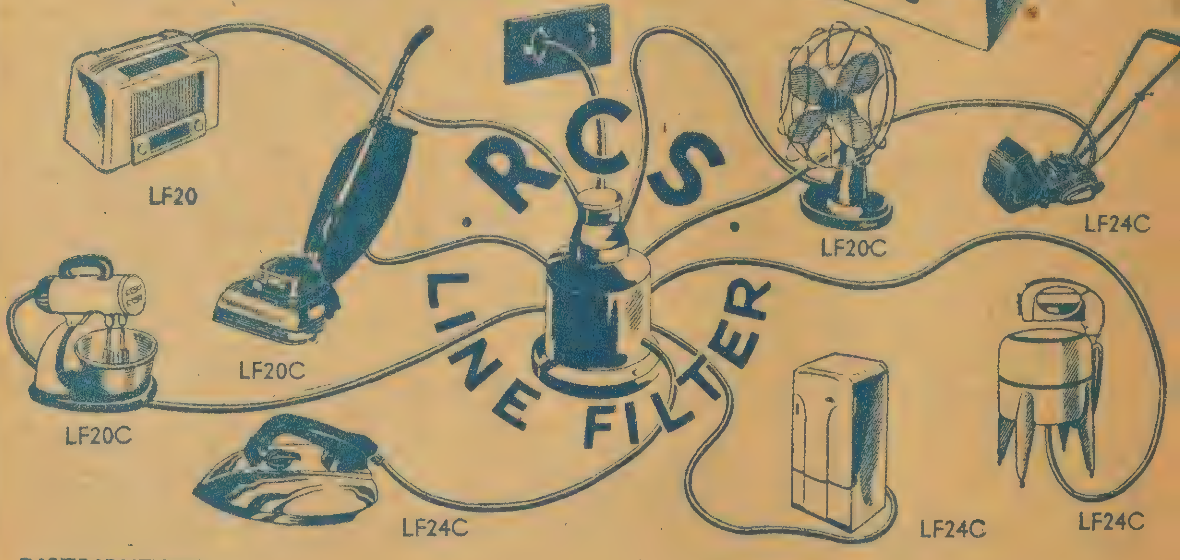
S2
S1
P1
TWIN PLASTIC LEAD→
P2
SET TRANSFORMER
RADIO SET
A
E
S1
S2
P1
P2
PLASTIC EARTH WIRES
EARTH

MAKE THIS SIMPLE TEST:—

1. Remove aerial from set. If the noise stops, you need an AF21C aerial filter, as the noise is coming through your aerial.
2. If the noise continues, you need an LF20 line filter as the noise is coming through your power main.
3. If any of the appliances shown below are causing the noise, then fit to it a line filter of the type shown.

Retail	AF21C aerial filter	140/-
"	LF20 line filter ..	37/-
"	LF20C " " ...	42/-
"	LF24 " "	50/-
"	LF24C " "	55/-

CONFINE NOISE WHERE IT STARTS — WITH R.C.S. LINE FILTER



R.C.S.
LINE FILTER
LF20
LF20C
LF24C
LF20C
LF20C
LF24C
LF24C
LF24C

DISTRIBUTORS:—

N.S.W. Bloch & Gerber—Fox & MacGillycuddy—U.R.D.—John Martin — Lawrence & Hansom — Homecrafts — Martin de Launay — Radio Despatch — Cooke Bros. —

W.A. Carlyle & Atkins

S.A. Gerard & Goodman.

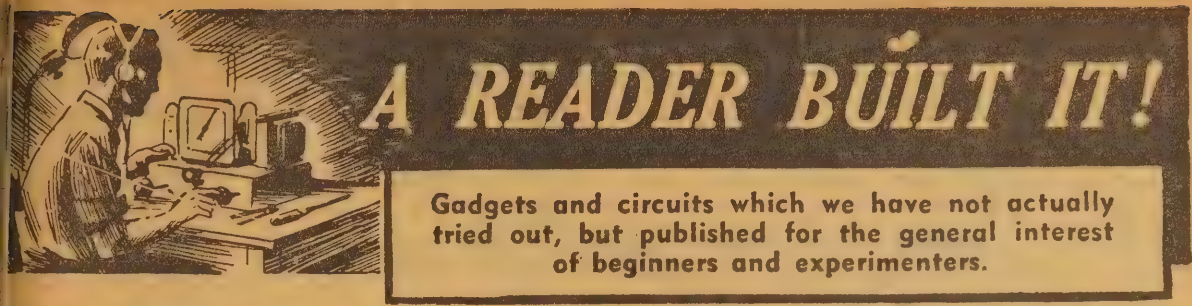
VIC. R. E. Trickey—Homecrafts—Motor Spares—Radio Parts.

QLD. B. Martin & Irvine—Chandlers.

TAS. Homecrafts — W. G. Genders.

R. C. S. RADIO PTY. LTD.

651 FOREST ROAD,
BEXLEY. PHONE LW3491


A READER BUILT IT!

Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.

PICKUP COMPENSATING AND PREAMPLIFIER CIRCUITS

No high fidelity amplifier system seems to be complete, these days, without compensating controls which allow the response to match the different recording characteristics and to minimise, where necessary, the severity of obvious distortion.

'HE equalising circuit shown on the right has been suggested to by Discobolus, whose Record ws appears elsewhere in the magae. For personal reasons, he pres to remain anonymous.

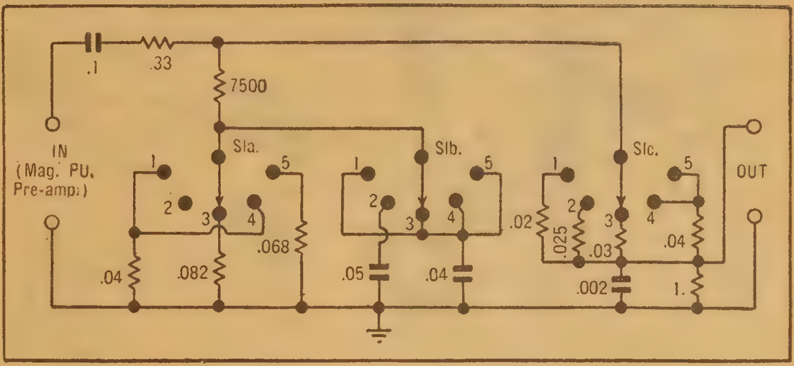
Discobolus is an enthusiast who lieves that best results can only obtained from current recordings the precise recording law is asrtained and the characteristics of e amplifier set to give just the ht amount of treble cut and bass ost and starting at the correct quencies.

JCH RESEARCH

To assist in this direction he has de a close study of the characteres used by the major recording npanies throughout the world. is has involved not just mere els, but also the origin of each orded work.

n all, Discobolus believes that stralian listeners can meet most npensation requirements by using 5-position selector, each position ing a slightly different overall quency law.

The suggested arrangement to isfy this requirement is as shown, involving only simple R/C circuits. It is intended to give complete compensation and, according to the contributor, renders further "tone control" adjustments unnecessary on good recordings.


.1
.33
7500
IN
(Mag. PU.
Pre-amp.)
S1a.
S1b.
S1c.
1
2
3
4
5
.04
.082
.068
.05
.04
.02
.025
.03
.04
.002
1.
OUT

Switch positions are as follows: (1) English Decca LP and 45's; (2) Mercury, Capitol and Westminster (AES); (3) RCA Victor, US-HMV LP; (4) UK HMV LP, Vox, US Columbia LP; Vanguard, Bach Guild, Cetna Soria LP; (5) MGM, Artist, Tempo, Westminster (where indicated on record cover).

The network has a high insertion loss—actually 34db—so that it could be connected in the output circuit of a pickup only where the latter had a large reserve of signal to drive the existing amplifier.

The same general remark would apply if the network were connected between an existing preamplifier and main unit.

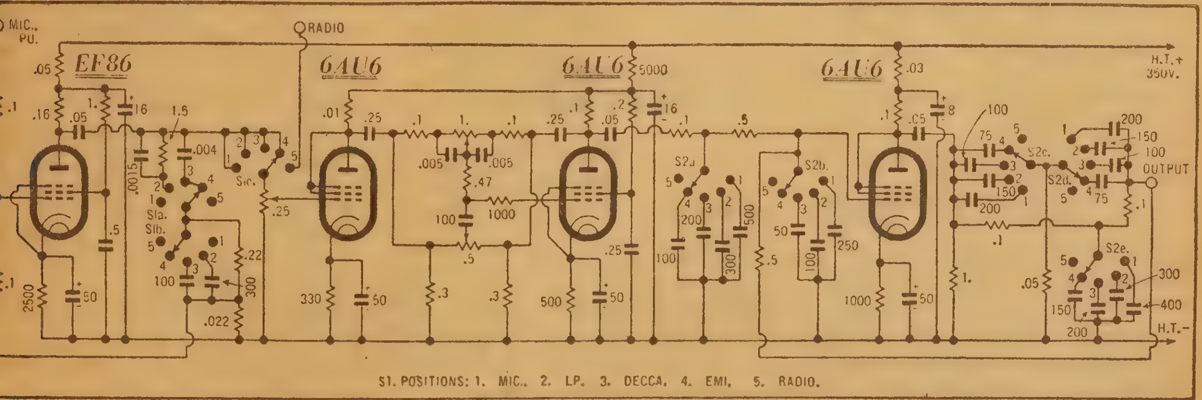
The suggested scheme is to connect the network between cascaded sections of the twin triode, which should then leave enough gain to allow a magnetic pickup to drive into an ordinary basic amplifier.

The second circuit, shown below, was submitted by Mr. H. B. Strantzen, of 32 Edgbaston Rd., Beverley Hills, NSW. It is one of the most comprehensive preamplifiers we have seen, but can be built and tested stage by stage for simplicity.

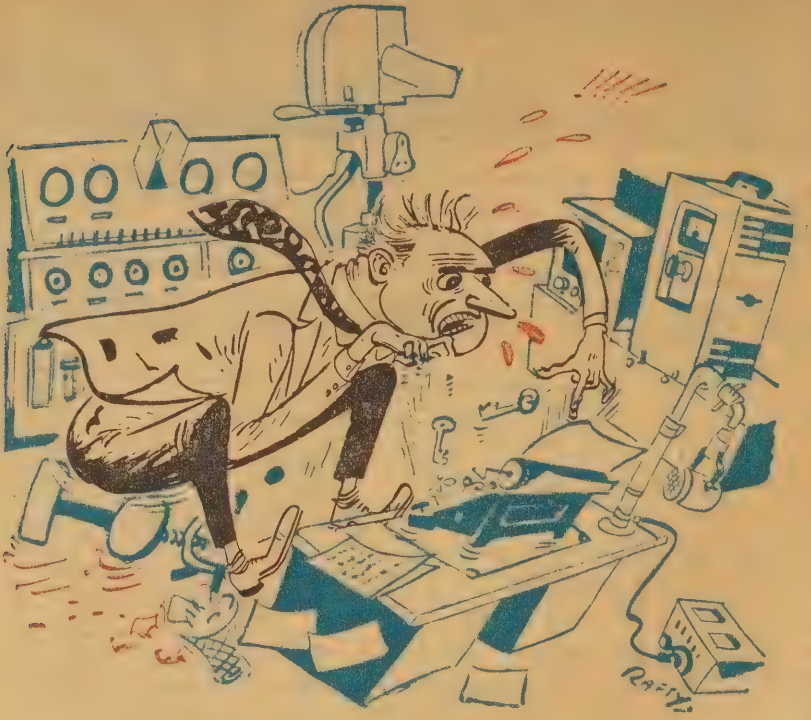
Based on overseas designs, the input stage gives a selection of preset characteristics and functions, using a feedback type circuit.

The centre section of the circuit, involving two linear potentiometers, gives continuously variable bass and treble control, with their centre positions each "level". The final 6AU6 and S2 gives a range of more or less sharp cut-off positions to combat distortion in bad programs.

All capacitors in this section are close tolerance types to ensure accurate roll-off frequencies.


MIC.,
PU.
RADIO
EF86
6AU6
6AU6
6AU6
H.T.+
350V.
.05
.16
.05
1.
16
1.5
.004
.0015
S1a.
S1b.
S1c.
.25
.5
.22
100
300
.022
2500
50
.01
.25
.1
1.
.005
.005
.47
1000
100
.5
.3
330
50
.1
.25
.2
.05
5000
16
.25
500
50
S2a
S2b
200
100
300
500
.5
50
100
250
.03
.1
.05
8
1000
50
100
75
S2c.
200
150
100
OUTPUT
S2d.
75
150
200
.1
1.
.05
S2e.
300
400
150
200
H.T.-
S1. POSITIONS: 1. MIC., 2. LP, 3. DECCA, 4. EMI, 5. RADIO.

Here is a circuit for anyone who wants to become a little more adventurous. The stages should follow a logical layout progression and must be fed from a remote power supply to avoid chassis hum. Mr. Strantzen claims that the original unit is free from hum, even on the "Mic." channel and with full bass boost.



Let's Buy An Argument

I think that we should pause, in our flurry of building and listening to amplifiers, to straighten out our thinking about two or three very simple terms. I refer to nothing more remote than the terms "single-ended", "push-pull" and "balance".

TO underline the need for some straight thinking, I quote from a letter received a few months back on this subject. The writer shall remain anonymous, except for his initials, for he may well have changed his ideas in the interim. I don't know.

Sufficient to say that the apparent assumption, at the beginning of the letter, is that a single-ended amplifier is not worthy of a good speaker. That no one who has any ideas of serious listening should really bother with one.

That belief, let me say, appears to be held very widely.

I wonder why?

USUAL ANSWER

When pressed, the usual explanation is that push-pull amplifiers "cancel distortion" and they must therefore be a lot better than single-ended circuits. How loose can a statement become?

Let me say here and now that I'm not holding a brief for single-ended amplifiers. I'm merely interested in getting a few ideas straightened out and seeing that justice is done. That's all.

I use a push-pull amplifier myself but not the least important reason for doing so is in the knowledge that it can make a big noise if called upon.

But with children who allegedly "need their sleep", neighbors who go to bed at nights, and so on, most times I could get by quite well with a single UX201-A. Quite a few other folk admit shamefacedly to the same kind of limitation.

by **Neville Williams**

But let's get back to the subject.

In the first place, I strongly suspect that many who condemn single-ended amplifiers have never heard a good one. They're rather like the motorist who trades a '26 model Austin for a '53 model Cadillac and proceeds therefore to ridicule English cars. (Austin fans can read "Morris").

The point is that most enthusiasts start off with a single-ended amplifier stage must operate at all times muc closer to overload and with muc higher average distortion than wou otherwise be the case.

The mere introduction of a push pull output stage, even retaining th poor quality components, must mak an obvious improvement to the per formance (1) because it relieves sat uration of the transformer core; (2 it makes available more power outpu or the same output for less distortio and (3) it leads to some cancellatio of harmonics.

MUST HAVE BEEN POOR

Anyway, the mere fact that on can talk about an "obvious improvement" is itself a guarantee that distortion in the original single-endec unit must have been very high.

In other words, one amplifier car only be an "obvious improvement" or another in a listening test, if the firs one is pretty poor. Such is the limitation of our hearing and the imperfections inherent in the average record, pickup and speaker.

But the vital point is that a single-ended amplifier does not have to use mediocre circuits and components. It can be built with the same care as your favorite push-pull amplifier—

—either the audio end of a s knocked together from inexpe parts. The chances are that the c has lacked any refinements at al involved an ordinary, cheap ou transformer.

Later, with interest duly awake they have set to and built a ambitious amplifier, with push- output, negative feedback, a transformer and perhaps other finements into the bargain.

It sounded better, of course, here's the point: As often as not credit for most of the improver goes to the push-pull stage!

SEVERE DISTORTION

Very naturally, the distortion "primitive" single-ended ampli can be very high, particularly if it volves a high-mu triode and an put tetrode without feedback.

The whole treble range, incluc harmonics, is accentuated. The l end suffers too, because the out transformer simply can't transfer the voice coil anything like reasona power without a complete break of the waveform.

And because the efficiency of transformer isn't high anyway, output valve is grossly mismatch (even nominally) and is required pump at least twice as much au into the primary as ever gets to voice coil. As a result, the outp the picture then changes otly!

h a proper sequence of stages plenty of feedback (as in a push-pull amplifier), the distor- evel gets down pretty low. With od output transformer, there is difficulty in maintaining full r to the bottom end of the e.

tching and efficiency improve, ving the voice coil to receive r very close to what the output e is supposed to be delivering t what does this mean in pra- Is the distortion then low gh and is the performance good gh for serious listening, assum- that only moderate output power equired?

general, I'd answer "yes" to questions.

ne important point is that we t have to assess an amplifier's ortion as so many percent above . Not in practice anyway! It to be lumped in with the overall ortion of the system, from the ustic conditions in the recording dio, right through the complicated in of events to the acoustic condi- ns in our own listening room.

ACTICAL QUESTION

The question should really be, oes my amplifier chassis make a nificant contribution to the overall tortion?"

This was really the theme behind "Playmaster" series of ampli- rs, which have proved extremely pular. The designs were aimed to e very good results without going cranky or critical limits, in nieving figures that could only be preciated with laboratory instru- ents—certainly not by ear.

In that series, the "Playmaster nior", with its single 6V6, was vir- ally indistinguishable at room lume from the larger designs, using high quality pickup and speaker. At loud volume, or with a specially sensitive speaker, the difference ight have been more apparent, rgely as a result of the smaller it approaching overload.

But here's the point: There's no aring, shrieking difference between well-designed single-ended and a ell-designed push-pull amplifier. ithin the power limits imposed by single small valve, the former can e very good indeed and contribute ery little to the overall distortion f the system.

ASIS OF COMPARISON?

I wonder what kind of comparison rompted our friend A.H.D. to write n that fashion? Did he compare is push-pull amplifier with a single- nded job of EQUAL design merit? Did he base his judgment on a trict "room-volume" test or did he ield to the almost irresistible urge o wind up the volume for the ccasion?

There's the world of difference etween the power required to "wind p the volume" and the fraction of a watt necessary to drive a sensi- ive speaker at average room level.

And, of course, over-riding mere technical argument is the query . . to what extent was our correspon- dent's observation colored by imag- ination.

That's not an insult aimed at A.H.D. either. When listening to amplifiers, we're all prone to "imaginitis" and I'm no exception.

However, as I said earlier, I didn't set out to champion the cause of single-ended amplifiers. They have simplicity on their side and they can quite easily give reproduction of a very high standard.

However, if the cost is no object and if you want a greater margin between the maximum power rating and the normal operating level, then by all means build a push-pull job. You can rightly expect reduction in distortion due (1) to cancellation of harmonics, (2) to lack of transformer saturation and (3) a greater margin of power.

But always remember that we can (and should) be talking about fractional percentages in the amplifier itself and something even less significant when considered against the overall distortion of the system.

If you think it's worthwhile, if you think you can hear the difference, by all means go ahead.

But there's a suggestion, very commonly put, that push-pull amplifiers are really no good unless the out-of-phase signal voltages are very accurately balanced. In other words . . . "best not at all, if it can't be right".

Since the observations are made in the interests of ultimate fidelity, one can be excused for thinking they apply to class A amplifiers, which are generally preferred for this same reason.

OVERSTATE THE CASE

Such is the enthusiasm of the grid-drive jugglers that the reader (or hearer, as the case might be) is left with the general impression that an unbalanced push-pull class A stage is a very evil device indeed.

I wonder if you've ever realised that just about the ultimate in unbalance is a single-ended amplifier? (I'm thinking of everyday practical circuits, not screwy ones.)

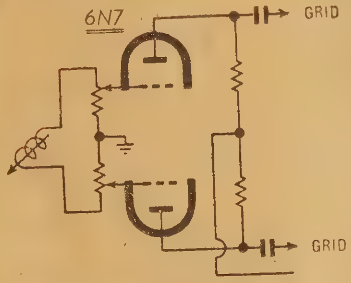
And, if you concede that a single-

A PERFECT PUSH-PULL SYSTEM?

For a long time I have been an amplifier enthusiast, and have built up many amplifiers, large and small, good and bad. A few of them have been single-enders, which always worked well within their own limits. However, I was lucky enough to buy a Goodman's 150 speaker at a bargain price, which I promptly put into a vented enclosure.

Having done so, I realized the shortcomings of the single-end jobs. So off I went into push-pull but there was one little point I was never happy about, namely the phase changer.

I always maintained that without elaborate testing equipment, one had no hope of checking the output for balance. It always appeared as though the final result was a big guess, and I was never happy about any type of phase inverter circuit that I tried.



All the articles I read only left me in the dark all the more. Of course, I knew that a good transformer gave an even voltage, but transformers have their limits of response, and my pocket has a limit too.

So I got to thinking, surely a phase inverter of any sort could be dispensed with? My thoughts naturally ran to the pickup, that being the source of signal.

And then it struck me—a pickup generates a signal, having a positive and negative at any given instant, and would not the said positive and negative be exactly 180 deg out of phase? and of equal amplitude? Of course they would. Then why not feed them straight to two grids? To the drivers for two output tubes?

No sooner said than done. I hooked two leads to the GP20 and fed them to a 6N7 as shown.

The result was, to say the least of it electrifying. Here at last I had the perfect push-pull system. All that remained now was to get a ganged volume control (matched) of 250K each side, this being right for the 6N7 and also being the proper all over load for the GP20. Then to balance the output by attention to the gain of drivers &c.

And here is where the simplicity of it struck me. One only has to feed a "single end" signal into both grids and, ideally, there should be no signal heard at all, even at maximum volume setting. Right? Any out of balance showing could be fixed in a variety of ways in grids or cathodes or plates. A semi-fixed pot. in one grid would offer an easy method.

I have since been told by a "radio-active" friend that this is known as "balanced input", and is as old as the hills. Quite so, but I've never at any time read of or heard of balanced input, not even in Radio and Hobbies. Any bites?

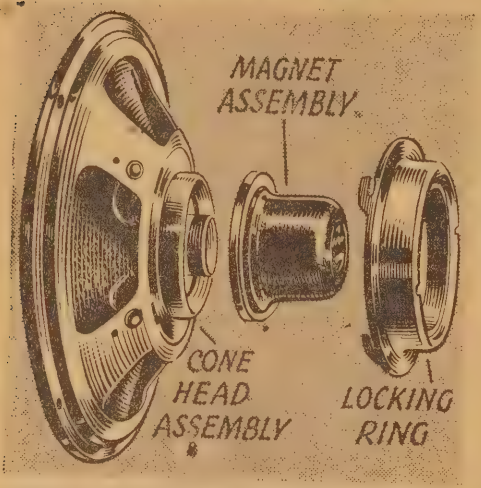
Naturally this circuit offers a setback to a radio tuner, but I'll get round to thinking out something, even if I have to build a balanced input receiver starting at the aerial. At the present moment I'm toying with the thought of there being two diodes. Any suggestions?

Hoping you can get the trend of this, and wishing you all the best.—A.H.D., Kew.

EVERYTHING for the Radio Hobbyist

INSIST ON

MAGNAVOX



NOTE THESE COMPETITIVE PRICES

MODEL	PRICE	MODEL	PRICE
525	43/-	8P1	63/-
6P2	54/7	10P2	67/3
6P1	58/11	10P1	72/9
8P2	57/5	12P2	72/4
12P1	81/-		

THE

WARBURTON FRANKI

PAGE

● **Check it each month**

PERMAGNETIC CENTRE POLE SPEAKE

The ONLY Speakers with all these outstanding features

- FULLY DETACHABLE & INTERCHANGEABLE CO HEAD ASSEMBLIES (See illustration).
- DAMAGED CONES EASILY REPLACED in 3 minut
- ALL TRANSFORMERS TROPIC PROOFED AND I TERCHANGEABLE THROUGHOUT THE RANGE.
- FULL RANGE OF TRANSFORMERS WITH IMP DANCE CLEARLY BRANDED.
- TRANSFORMERS HELD WITH P.K. SCREWS — N DRILLING or PUNCHING — NO NUTS TO LOSE.
- 5in, 6in, 8in, 10in, 12in SPEAKERS AVAILABLE WIT HEAVY OR MEDIUM DUTY MAGNETS.

SPARE CONE HEADS ALSO AVAILABLE FROM STOC

CHOOSE YOUR MICROPHONE FROM W. F.'s EXTENSIVE RANGE OF ALL TYPES . . . . .

ACOS HAND-DESK COMB. MICROPHONE

TYPE MIC30
Crystal -- £7
As illustrated

ZEPHYR 8XA CRYSTAL
(illus. at left) £7/14/ 3
4XA for Tape Recorders etc -- -- -- -- £6/17/ 6
7XA for Tape Recorders etc -- -- -- -- £3/15/11
90 Gen. purpose Dynamic from £9/8/1
Zephyr 5XA Omni-Directional Crystal Microphone £7/10/11

STEANES DYNAMIKE
Moving Coil
Grid -- -- -- £11/7/8
50 ohms -- -- £ 9/9/4
Torpedo Velocity Type -- -- -- -- £9/16/4
Dynamax, from £8/ 1/9

Zephyr IXA Crystal Mike Insert, £2/17/6
Adjustable Floor Stand, Light, £4/ 2/6
Heavy, £6/ 1/6
Three Way Mini Stand -- -- -- £1/0/10

● ***WRITE FOR ILLUSTRATED PAMPHLET OF ALL ZEPHYR EQUIPMENT***

WARBURTON FRANKI (MELB.) LTD.

380 BOURKE ST., MELBOURNE, C.1... PHONE: MU6355

OPEN SATURDAY MORNINGS

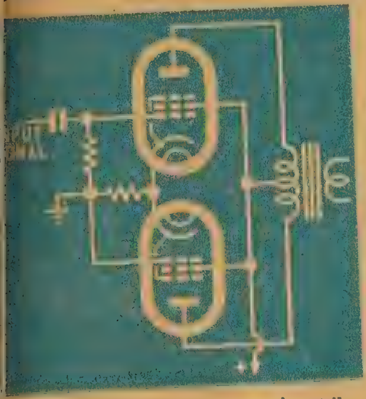
●

TRADE SUPPLIED

. . . POSTAGE OR FREIGHT MUST BE INCLUDED WITH ALL ORDERS . . .

amplifier can be good, then mber that you are speaking of thing that represents, as I said e, the ULTIMATE in unbalance. adding a second output valve supplying it with an appropriate l, even somewhere near the amplitude, you must of necesbe a lot closer to the accepted s of balance in the output transer, greater reserve of power, and ellation of even harmonics.

just has to be that much betthan the kind of amplifier we've ady demonstrated to be capable ood results. In fact, if every-



he former "Barnes Mystery Circuit". The lower valve receives drive only hrough the unbypassed cathode resistor. But what happens if the valves are triodes and the resistor is fully bypassed?

ing else is in order, a minor deee of unbalance just can't make it d!

Once again, don't get me wrong. y all means strive for balance and hieve it if you can, but don't let become a fetish!

Just here I'm reminded of the old Barnes Mystery Circuit" that caused much controversy in the days of ireless Weekly. I have yet to iscover what the mystery was!

The idea was to connect two utput valves in what looked a noral push-pull circuit, but merely arthing the lower grid, instead of roviding drive for it.

OME IMPROVEMENT

Naturally enough, the bass reponse improved, due to the cancelation of the DC component in the utput transformer—an important actor in those far-off days. Then, if he cathodes were coupled and not ypassed, the lower valve received ome drive therefrom, increasing the ower sensitivity, and, to some exent, the maximum power output.

Happily enough, the demonstraions were normally carried out with entode valves having a high value of plate resistance.

With two triodes so connected, the plate resistance of the second valve could constitute a load on the active one, thereby tending to reduce both gain and output instead of increasing it.

Partial cathode drive would relieve the situation to varying degrees, depending on the constants of the tubes involved and the amount of cathode coupling.

I daresay that one could think up similar complications with feedback loops around such a stage. But why bother?

I fear that our friend AHD has come perilously close to making a fetish of balance as well as push-pull in amplifiers. Something must have been very wrong with the original set-up for his new all push-pull system to sound "electrifying".

Whatever mysterious benefits the scheme may have conferred, the fact remains that the signal source was nothing more pretentious than an Acos GP20 pickup operating into a 0.5 meg. load.

In its price class, the GP20 is mechanically an excellent pickup, but, as we have demonstrated on previous occasions, it has the familiar rise around 5 or 6 Kc, which tends to unbalance the top end and to boost the record noise. Unless properly compensated (see the Nov. '52 issue), it is most unlikely ever to sound "electrifying", even though the following amplifier were perfect.

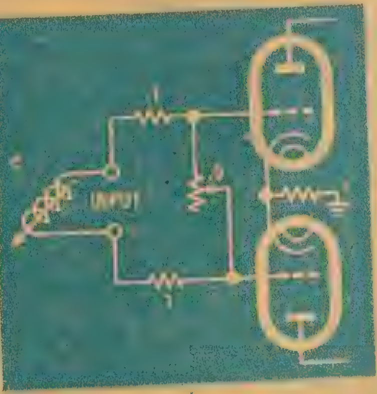
BETTER RESULTS?

Unless AHD was extraordinarily fortunate with the particular cartridge and/or some accidental compensation on the part of the speaker, I'd wager that even better results would have been obtained with an accurately compensated input system and, with any good amplifier at all to follow—single-ended or push-pull, accurately balanced or otherwise!

As far as the method is concerned of obtaining push-pull, it is certainly not new.

Apart from anything else, it involves the obvious difficulty of obtaining potentiometers which will match one another accurately throughout the whole of their travel and also the whole of their service life. If they don't—and you certainly can't guarantee that they will—then the circuit won't balance and you're right back to where you started from.

The difficulty can be overcome in part by using a shunt type control, as illustrated, preferably with a reverse taper to ensure normal operation. It involves some loss in signal level and puts the whole grid circuit at a high impedance—factors which may or may not be important.



A method of avoiding ganged controls. The load impedance on the pickup is variable, however, and the network involves some loss.

However, the significant point is that, whatever magic the overall push-pull might work, it certainly would not afford any compensation and the driving signal would still be delivered to the grids "in the raw".

Because compensation is so important, it is becoming almost universal

Dual FA

For all THREE speeds

DUAL Recordchangers and players are the most advanced models available in Australia today. Masterpieces of engineering, their flawless reproduction ranges from 20 cps.—15,000 cps.

Recordchanger 1002F will change 10 MIXED 10in and 12in records and 10 7in records **with large centre-holes.** Changers and players may may also be used manually and 7in centre inserts are **supplied free** with each unit.

DUAL Changer Model 1002/F complete with NORMAL and LARGE CENTRESPINDLES.
PRICE (Sydney) **£35/12/6**

DUAL 3/Speed player chassis 275 complete with 3 position scratch filter, already mounted on springs.
PRICE (Sydney) **£19/10/6**

Available from better dealers everywhere.

DUAL Recordplayers and Changers are marketed and serviced by

FRED A. FALK & CO.
PTY. LTD.
28 King Street, Rockdale, N.S.W.
Telegrams: GRAMOFALK.
PHONE: LX 4783.
Agents in all States

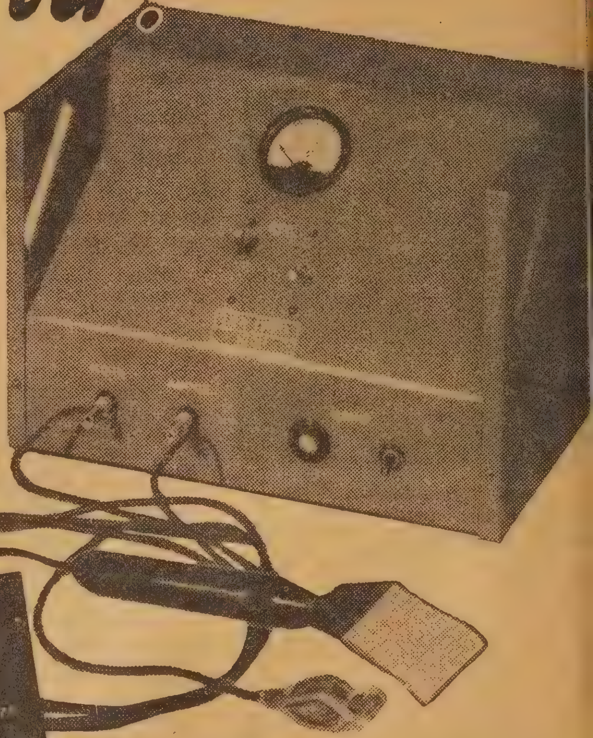
You'll need a "PLATTERRACK"

New Electroplating technique for . . .

Plating in Situ!

Yes, it's now possible to bring the plating tool to the job, deposit metal speedily and efficiently, and save the high cost of dismantling and re-assembling equipment formerly plated in the bath. A typical example: T.A.A. uses Scope Portable Industrial Electroplating unit for replating Convair airscrews with zinc. The Scope Electroplating Unit is ideal for—

1. Plating on equipment which otherwise would have to be dismantled and re-assembled.
2. Plating with any one of seven metals as required on screws, sheetmetal, fittings, with regular or irregular surfaces.
3. Silver plating of light reflectors, electrical contact surfaces including busbars.
4. "Doctoring" faulty plating without the need of completely stripping and replating a whole article.
5. Copper plating for selective case hardening of tools and dies without using stopping-off lacquers or plating baths.



SCOPE

Portable INDUSTRIAL ELECTROPLATING UNIT

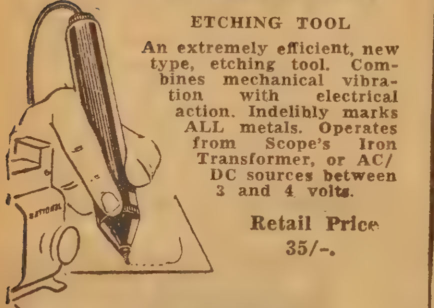
The rate of deposition is remarkably high—a deposit of .0003in. of zinc can be made over an area of 40 square inches in 10 minutes. Deposits are non-porous, hard and bright.

PRICE . . . includes plating tool with 1in. and 4in. anode assemblies, return lead, spare anode pad for each size, mains operated power supply, detailed operating instructions and plating technique. Plus 12½% Sales Tax. **£23/18/-**

PLATING COMPOUNDS . . . 1½lb. jars: nickel, copper, tin and zinc, £1/5/6. Cadmium, £1/14/-. Silver, £3/8/-. Gold, £6/8/-, plus 12½% Sales Tax.

VIBROSCOPE

ETCHING TOOL

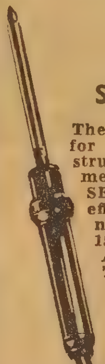


An extremely efficient, new type, etching tool. Combines mechanical vibration with electrical action. Indelibly marks ALL metals. Operates from Scope's Iron Transformer, or AC/DC sources between 3 and 4 volts.

Retail Price 35/-.

SCOPE

SOLDERING IRON

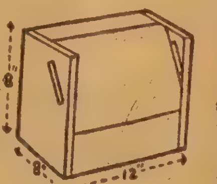


The Standard soldering iron for all radio, electrical, instrument and light sheet-metal work. Heats in SIX SECONDS, Scope is speedy, efficient, and its effectiveness is equivalent to a 150W iron. Operates from A.C. mains with National Transformer optionally supplied or from a car battery. Retail Price: Iron, 50/-, Transformer, 47/11.

SCOPE

INSTRUMENT BOX

Ideal for use in the construction of battery chargers, multimeters, VTVM's, oscillators, bridges, portable amplifiers, inter-com's, L.T. or H.T. power supplies and laboratory instruments. Solidly constructed from sheet-steel, adequately ventilated, grey hammer-stone finished. Used in the B.B.C. Price 37/6 plus 12½% Sales Tax.



Phone Mr. D. C. McKenzie at BX 1131 for further details and demonstration.

DISTRIBUTORS IN ALL STATES

N.Z. Distributor: H. W. Clarke, Auckland & Wellington.

Australian & Overseas Agents:

WM. J. McLELLAN & CO. PTY. LTD.

126 Sussex St. (just North of King St.), Sydney. BX 1131

MANUFACTURED BY SCOPE LABORATORIES, MELBOURNE, VICTORIA ensating circuits for both pick- and record characteristics, and input circuits are often just as plicated as main amplifier it-

ist imagine having to do it all in -pull, or yet again, for good sure, having to turn your attens to the tuner, as A.H.D. sugs. The final job, to be consistent, ld be to ensure that all program erial you accepted had passed through push-pull stages.

d take up fishing instead!

other words, I think it is clearly of those ideas which is not worth suing. The point you can adce in its favor are of secondary ortance and heavily outweighed the difficulties of it. And any efits can generally be achieved, ng with others, in better ways.

o, I feel that, if one has that ch time, money and enthusiasm invest, then it can be directed more profitably to other aspects of the design.

Still, I could be wrong.

As for phase inverting stages, I do not share our correspondent's apprehension. For class A operation, one can choose any one of a number of circuits and be assured that they will remain in reasonable balance for as long as necessary.

As I mentioned earlier, a few per cent unbalance in a class A amplifier is not to be compared with the "ultimate unbalance" of a single-ended stage.

As for the matter of harmonic cancellation, let me suggest that it is a "handy" feature of a push-pull class A amplifier, but that's about all one can say. (Don't forget, we are talking about ordinary class A domestic amplifiers.)

Remember that push-pull cancels only the even harmonics generated in the stage itself and that even harmonics generally are less objectionable than odd harmonics.

ODD HARMONICS

To obviate the odd harmonics, it is still necessary to rely on a careful choice of valve operating conditions, an adequate margin of power output, choice of good quality components, and the liberal use of negative feedback. Having taken all these steps, you won't have many even harmonics left to cancel—and that's the crux of the whole matter!

You shouldn't have to rely on push-pull to reduce harmonic content, handy though this feature may be.

I say this is the full knowledge that many opposing views have been put forward on the subject.

I've seen long screeds written about phase changers, good and bad, with the implication that your troubles are over once the inversion stage gives balanced output. Without debating actual circuits, let me say that the question of balance must take in also the output valves and output transformer.

It is useless driving the grids with exactly balanced signals if different things happen in the plate circuits.

Then again, I have seen the need for balance "proved" by the telling of what can happen in a class AB1 or a class AB2 stage. That is perfectly true, but very few people use such stages, anyway, where fidelity is the main requirement. It's the "red herring" approach.

In such a case unbalance is obviously serious, and the ultimate in unbalance—a single-ended overbiased amplified—would be a very bad amplifier indeed. Not even feedback could put things right. To conclude:

I think we can leave it there. In case you've become lost in the maze, here are the points I've tried to make:

(1) Single-ended amplifiers are capable of high fidelity, provided the power required does not carry them into their overload region.

(2) Class A push-pull amplifiers, using adequate negative feedback, can be designed to give excellent results without special procedures to balance drive, valves and transformer.

(3) Overall push-pull is not worthwhile in domestic equipment.

(4) It is conceded that overbiased operating conditions will call for closer balance, because they very greatly accentuate the even harmonics. Even then, the ultimate degree of balance required depends on the use to which the amplifier is put.

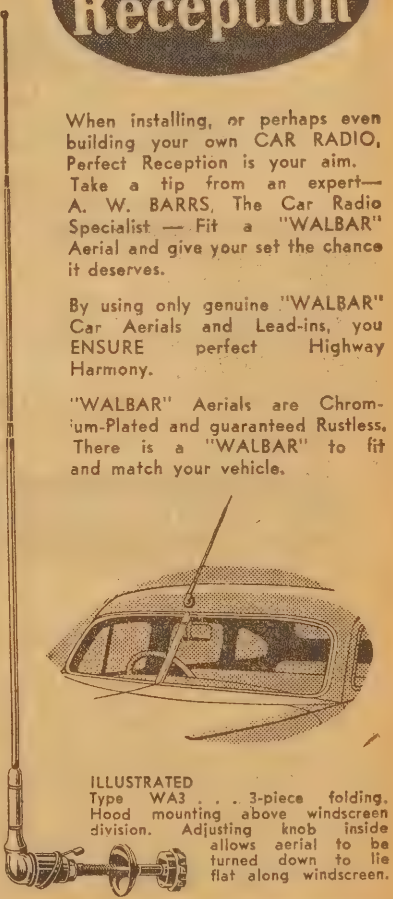
BRADMATIC
The name for
Hi-Fidelity Professional Tape Recording Equipment
Send for details of the latest type 5C & D 2-speed, 3-head decks
and
the complete 3-head professional tape recorder from the
Sole Distributors for Victoria, South Australia and Western Australia.
ELECTRONICS AUSTRALIA PTY. LTD.
41 Enfield St., Victoria Park, Perth
Phone M1261

UCC ELECTROLYTIC CAPACITORS
last longer!

Long life, small size and a wide range of ratings are some of the reasons why discerning users prefer UCC Electrolytics. Make sure you specify UCC.
Obtainable from all leading Distributors.
UCC *Capacitors for every application*
UNITED CAPACITOR CO. PTY. LIMITED
433 Punchbowl Rd., Enfield, N.S.W.
Telephone LF3511
UCC.41.S

AWA RONETTE
MICROPHONES & ACCESSORIES

Type HM7
£7/3/6
Technical pamphlets will be mailed on request.
Other types also available from
NEWTON McLAREN
17 LEIGH ST., ADELAIDE
and leading wholesalers.

Perfect Reception
When installing, or perhaps even building your own CAR RADIO, Perfect Reception is your aim. Take a tip from an expert—A. W. BARRS, The Car Radio Specialist — Fit a "WALBAR" Aerial and give your set the chance it deserves.
By using only genuine "WALBAR" Car Aerials and Lead-ins, you ENSURE perfect Highway Harmony.
"WALBAR" Aerials are Chromium-Plated and guaranteed Rustless. There is a "WALBAR" to fit and match your vehicle.

ILLUSTRATED
Type WA3 . . . 3-piece folding. Hood mounting above windscreen division. Adjusting knob inside allows aerial to be turned down to lie flat along windscreen.
Walbar
CAR AERIALS & LEAD-INS
Obtainable from all leading Motor and Radio Accessory Wholesalers and Retailers.
WA6

The World's best known Recording Tape

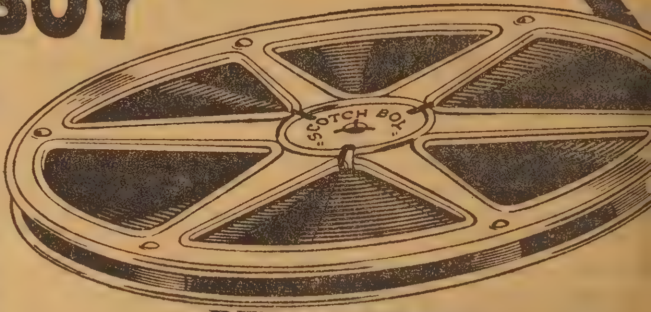
"SCOTCH BOY"
TRADE MARK

MAGNETIC RECORDING TAPE

The choice of Radio Stations the World over!

New improved Scotch Boy Magnetic Recording Tape should be your choice, too. It lasts a lifetime, can be edited and erased, has greater sensitivity, lower noise level, and there's no tendency to stick to the recording head. In reproduction it meets the strictest demands of the world's chief radio stations.

FITS ALL TAPE RECORDERS



RETAIL PRICES
45/- per 600ft. reel
70/- per 1200ft. reel

OBTAINABLE NOW, AT

VEALLS FRIENDLY STORES

and all good radio and electrical stores

Wholesale:—Vealls Electrical & Radio Pty. Ltd.
31 Therry St., Melbourne. FJ0456

Nothing but Tape Recorders

See them ALL in town at Magnetic Sound including this new two-speed

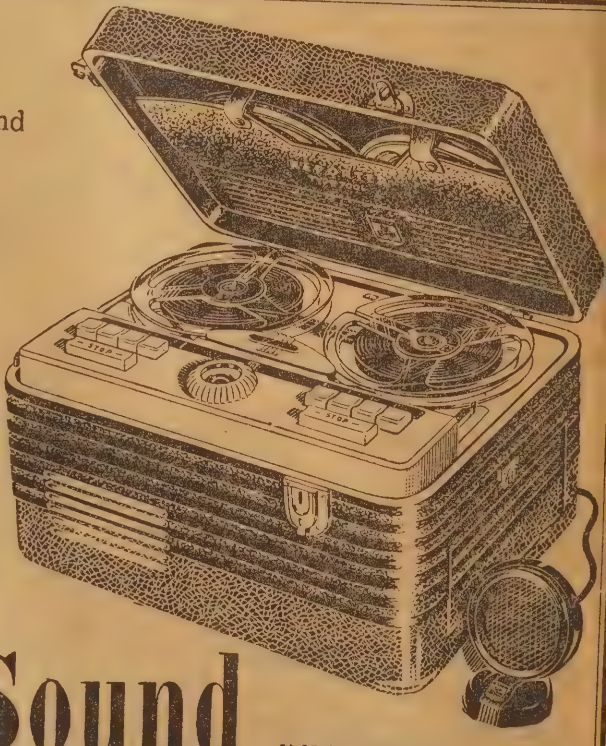
GRUNDIG *"Reporter"*

The world's finest, with exclusive PUSH-BUTTON CONTROL

£25
DEPOSIT

You can now see and hear this amazing new Grundig at Sydney's Tape Recorder Specialist. The touch of a button gives mastery of perfect recording and reproduction, two hours of recorded music or speech on every reel, plus two speeds, twin tracks, unique condenser microphone and special speaker. Grundig is ideal for dictation, too. Cash price 150 guineas.

★ *Take advantage of the truly specialised service, 6 months' guarantee, full accessory range (including foot control), home demonstration and Tape Recorder Hiring Service offered by . . .*



Magnetic Sound INDUSTRIES (AUST.)

385 GEORGE ST.—OPPOSITE STRAND ARCADE
OPEN SATURDAY MORNINGS 9-12 Take lift to Lower Ground Floor. BX4440

"Nothing but Tape Recorders". See details of other models on page 96 in this issue.

RADE REVIEWS AND RELEASES

ROFESSIONAL PORTABLE TAPE RECORDER AVAILABLE

lessrs. E.M.T. (Aust.) Pty. Ltd. have announced the cal release of their model TR50 professional tape corder. Produced in the parent factory at Hayes, ngland, the recorder is especially intended for use in broadcast stations and recording studios.

☆

Metal work of the recorder is in a light grey-green, with the carrying case deeper mid-green. The speaker fret is of reinforced metal gauze. Tonal quality from the in-built speaker is ample for most monitoring work, though an external speaker can be readily connected.

pictured on the right, the TR50 is a single unit recorder, measur- 13¼ x 18 x 17 inches overall; t weight is 59lb.

he model supplied to Radio and bies for test and comment was e TR50A, which has a simple er change to select operating eds of either 7½ or 15 inches per ond. Model TR5OB is for alterna- e 7½ and 3-inch speeds.

"spooling" control allows the e to be run in either direction a moderately high speed, brakes lting the reels instantaneusly and thout overrun. The tape is lifted the heads automatically when the eling control is in use.

A second control on the opposite le of the machine, provides for eplay" and "record", with a handy xiliary "monitor" position.

On the front panel, the program vel is indicated on a properly- mped decibel meter.

Separate inputs are provided for low impedance, high quality mi- ophone—available as an optional tra—and for "line". There is an tput circuit for "line" and for an tension speaker.

Makers' specifications on frequency response are for 50-6000 cps within 2 db. for 7½in. per second, but a check with even mediocre tape showed that these figures were conservative. Output was still evident at 10 kc; the waveform, as viewed on a CRO, was pure at all frequencies, with no evidence of heterodyne whistles

By way of criticism, however, the controls are heavy in operation, though very positive in action. Reason for this is in the use of mechanical control and interlock rather than solenoids. A poor tape also showed some tendency to jump on the erase head, although a pressure pad smooths out the movement of the tape over the R/P head.

Price quoted for the TR-50 is £255, plus sales tax. It is available only through E.M.I. (Aust.) Pty. Ltd., 301 Castlereagh St., Sydney.

A STABILISED AC SUPPLY UNIT

Among the products manufactured by Stabilac Pty. Ltd. is a range of electronic voltage stabilisers in ratings from 200 V.A. to 10 K.V.A. This type of stabiliser is very popular in industrial applications where constant voltage is essential.

HE voltage output is claimed to be stable for all load variations om zero to maximum, and will also mpensate for input voltage varia- ons between 190 and 250. It will lso operate over a frequency varia- on of plus or minus 10 pc. The response is practically instantaneous, and the maximum distortion introduced is 3 pc.

The principle of operation depends on a saturable reactor and a boost transformer. A DC supply is used to saturate the core and is controlled by a beam power valve.

The bias of the beam valve is controlled automatically by the output of a diode bridge, the diode being fed from the output circuit of the unit. Any change in output voltage is reflected in the bias of the beam valve, and changes in the DC current through the saturable reactor, thus correcting the output voltage.

E.H.T. BATTERY

EXTRACT from a letter from the Eveready Company may prove of interest to readers who are designing or building radiation detection equipment:

"In the article, Geiger Counters Find Uranium, by Raymond Howe, appearing in your March, 1954, issue, it is mentioned that complete dry battery operation need hardly be considered, because suitable high voltage batteries are not available in this country.

"While this may have been true some time ago, we would advise that the EVEREADY No. 493 battery, which we now manufacture, is very suitable for use with Geiger counters, scintillometers, and other equipment requiring a high voltage DC supply at a low current drain.

"The No. 493 battery is a 300v unit measuring 2 11-16in x 2 7-32in x 3 13-16in, with a total weight of 17oz. The retail price of this battery is 80/11 each."

WALTHAM'S

OF SYDNEY AND MELBOURNE

SYDNEY MAIL ORDER
& RETAIL STORE,
96 OXFORD STREET,
SYDNEY, NSW.

MELBOURNE MAIL ORDER
PO Box 5234,
MELBOURNE, C.1, Victoria.

Melbourne Retail Stores,
319-321 Swanston St.,
Melbourne.
393 Flinders St., Melbourne

"WALTHAM DAN'
THE BARGAIN M

Australia's largest mail order house for ex-Government radio, electrical, scientific and general service equipment.

Write for our latest catalogue of the many other bargains available.

TRANSCEIVERS

Type ATR.2B.

Crystal controlled and M.O. 12w output 3-7 megs. All Standard valves. Air tested. 12v operation. Can be converted to other frequencies.

£45/-/-

RADAR LORAN RECEIVER

Type APN.4

Containing the following Valves:
4—6SK7, 1—6SL7, 3—6B4, 1—6H6, 1—5U4, 2—2X2, 1—6SN7, 1—6SJ7, 1—6SA7. Many other useful components.
Brand new in cartons.

£7/10/-

RADAR LORAN CATHODE RAY INDICATORS

Containing the following Valves:
1—5GP1 CR Tube with full - length Mu - Metal shield, 7—1H6, 15—6ST, 3—6SL7, 1—6J7.
Brand new in cartons.

£25/-/-

MODULATING UNIT

Type 169.

Containing Klyston tube, 3 neon stabilisers, one EF50, two half-wave selenium rectifiers, one 5U4 rectifier, one CV.85, potentiometers, gears, resistors, high voltage condensers and transformer.

£4/19/6

SYNCHRONISER UNITS

Type 1155.

Containing the following Valves:
6—6SN7, 3—6L7, 2—6AG7, 2—6L6, 1—6H6, 2—6AC7, 6—717A. Brand new.

£12/10/-

VITA VOX

Public Address Loud Speaker Units. Voice Coil 12.5 Ohms DC resistance. Brand new.

£12/10/-

BENDIX RADIO COMPASS RECEIVERS

Type MN.26H.

Ideal receiver for use in small craft or fishing vessels. 12v input. Frequency range 200 to 410 Kcs; 550 to 1500 Kcs; 2.9 to 6 Mcs. Complete with 12 valves and genemotor. Valve line-up: 2—6J5, 2—6B8, 2—6N7, 1—6L7, 1—6F6, 4—6K7.

£24/17/6

A.T.5. TRANSMITTER

High Power Unit, using two 807 Valves. Covering 140 Kcs to 20 megs, with provision for six crystals and V.F.O. **£9/17/6**

Junction Box and Cables,
£5/-/-

Aerial Coupling Unit,
£3/10/-

BURKE GENERATORS

American Type GN-35.

Hand cranked, complete with handles and operating stand, also automatic cutout. Output 10v at 1.25 amps; 400 volts at .07 amps. These Generators can also be used to operate as 6 or 12 volt electric motors, without alteration. Final drive through reduction gear is approx. 200 r.p.m., drawing 5 amps approx. Ideally suitable as driving motor in trawling in small boats, on rivers or lakes, duck shooting, etc.

£2/10/-

A.W.A. TRANSMITTING CONDENSERS

25 mmfd.' to 375 mmfd.
15/6

TRANSMITTER TUNING UNITS

Type TU.10B
10,000 to 12,500 Kcs. **£2/10/0**

Type TU.9B.
7700 to 10,000 Kcs. **£2/10/0**

Type TU.26B.
200 to 500 Kcs. .. **£2/10/0**

Type TU.6B.
3000 to 4000 Kcs. .. **£3/10/0**

TELEPHONE RELAY PANELS

Brand new in wooden transit box. Panel contains full wave copper oxide rectifier, two phone jacks, one relay and one bayonet contact lamp holder and bezel.
Post Free all States.

12/6

MAGNAVOX

Two-valve, inter-phone amplifiers. Complete with filter, choke and output transofrmer.

£2/10/0

U.H.F. MIDGET HOMING RECEIVERS

Frequency range 234 to 258 mcs. Can be operated from either 12 or 24 volt internal changeover switch. Manually tuned dials. Calibrated in frequency.

£4/19/6.

MARCONI COMMUNICATIONS RECEIVERS

10 valves aircraft receiver 5 bands, frequency ranges 18.5 to 7.5 Mcs; 7.5 to 3 Mcs; 1500 to 600 Kcs; 500 to 250 Kcs; 200 to 75 Kcs. Easily converted to operate from 240v A.C. Dual ratio dial calibrated for all bands.

£45/-/-

TRANSMITTERS

Type GO9.

VFO Control. Frequency 3—18.1 Mcs: 300—600 Kcs. All switches and condensers, coils and valve sockets are mounted in porcelain. All controls can be locked. Two RF Output meters 0—9 amp; two 0—100 Ma Meters for quick current reading and one 0—15 Ma Meter. Unit relay control. Power output 100 watts.
Valve line-up as follows:—

Intermediate Frequency Transmitter.
1 Type—801 Master Oscillator.
1 Type—807 Intermediate Amplifier.
1 Type—803 Power Amplifier.

High Frequency Transmitter.
1 Type—837 Master Oscillator.
1 Type—837 Intermediate Amplifier or Frequency Doubler.
1 Type—803 Power Amplifier.

Rectifier Unit.
1 Type—5z3 low voltage Rectifier.
2 Type—1616 high voltage Rectifier.

Brand new £37/10/-

VALVES

BRAND NEW.
IN ORIGINAL CARTON

1H6	7/
1K7	10/
6AC7	15/
6B8	15/
2051	22/
6K6G	12/
6L7	12/
807	25/
830B	60/
VR.150/30	22/
954	7/1
12A6	12/
2050	22/

This valve is suitable fo use with Photo Cell Rela Unit, as per June, 195 issue of Radio and Hobbie

The above Valves onl obtainable from Melbourn Branch.

GENEMOTORS

Type 72, input 27v. 3.6 amps output 250v. 70 mA, and 12.6v 2.6 amp.

39/6

Type DA-3A, input 28v. 10.5 amp; output 300v. 260 mA 150v. 10 mA, 14.5v. 5 amp.

29/6

Type 31, input 18v. 12 amp; output 7.2v. 13 amp, 225v. 110 mA.

39/6

Any of these models can be converted without rewiring to operate fractional H.P. motors on 240v. AC.

RADAR RECEIVERS

Type CPR.46 AAT.

Containing Valves:
1—955, 3—956, 4—6AC7, and 24v Switching Motor, 1—6AG7, 1—83V, 1—2X2, and 24v. Switiching Motor.

£6/19/6

SELENIUM RECTIFIERS

Copper oxide, 12 volts, 4 amps. Suitable for battery chargers.

£2/5/-

W RELEASES FROM W. J. McLELLAN

w releases from Messrs. W. J. McLellan include a specially de- ned "Scope" instrument box and an industrial plating outfit which oids the need for plating baths and their accompanying inconvenience.

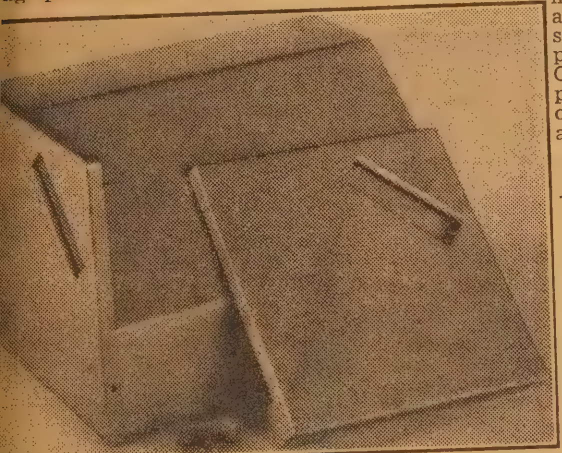
E instrument box, as illustrated below, breaks right away from sual panel and cabinet arrange- . It is based on a design used isively throughout the BBC for uments and other small items of pment.

the normal way, the section h forms the front, top and ng panel is first attached to two ends by means of self-tap- g screws, supplied for the pur- e. Components and controls can n be installed and wired, the hare ends allowing the instrument rest meanwhile in any conveni- position.

When construction and testing is nplete, the fold forming the rear d bottom is pushed into place d locked with self-tapping screws, ereby closing and completing the binet.

If required, the box will carry internal 10½ x 8in chassis, at- ched to the panel. It is louvred bottom and back for ventilation d is finished in a grey hammer- ne enamel.

The shape of the end plates pro- cts meters and controls from mage, gives the instrument an erall rectangular shape and pro- des integral carrying handles.



A view of the "Scope" instrument box, partly demounted to show its construction. It is just over 12 inches long overall and the ends are approximately 8 inches square.

Price is quoted as 37/6, plus sales tax, being available from most radio trade houses.

The power supply for the industrial plating unit, as mentioned earlier, is actually built into this case, and, therefore, provides an excellent example of its use.

The plating outfit comprises firstly a mains unit, which provides rectified DC at a voltage and current level to suit the various plating operations. Control on the front panel allows the DC output to be varied as required.

Also supplied is a cable and pad outfit which allow the chemicals to be applied to the surface, which requires plating.

In a demonstration arranged by the distributors, the unit showed its ability to plate screws and other small objects of a type so commonly encountered in radio equipment. It should be ideal for laboratories and custom equipment manufacturers, who might otherwise be held up for a minor plating job.

On a larger scale, the unit is already in use in the aircraft industry plating airscrews in service without the need for demounting them from the motor.

Full details of the unit are available from Messrs. W. J. McLellan & Co., Pty., Ltd., 126 Sussex St., Sydney. The price for mains unit and plating tools is £23/16/-, plus tax, plating chemicals being extra.

8W. AMPLIFIER FROM PHILIPS

ATEST addition to the range of Philips sound equipment is an -watt amplifier intended for gen- ral public use.

Measuring 9 x 9½ x 6½ inches verall, the amplifier weights 10½lb nd is intended for AC mains opera- ion. Valve complement is two 2AX7 twin triodes, two 6M5 out- ut pentodes and a 6V4 rectifier.

The finish is in grey hammertone aked enamel.

Provision is made for Mic input t 1.4 mV and for a pickup at 100 nV, thus providing ample sensitiv- ty for most requirements. The tone control is a switch-potentiometer combination, which provides switched bass cut of 18 db when required, or a progressive treble cut of 14 db with the potentiometer element.

Set for level reproduction, the overall response is quoted by the makers as being flat within two decibels from 30 to 15,000 cps.

Use is made of feedback in the output circuit to reduce harmonic distortion, to give a damping factor of three on the loudspeaker, and also to render the amplifier less critical to variations in output load.

Output transformer tappings are provided for loads of 1200, 600 and 300 ohms, but the manufacturers stress that the speaker system need be arranged to provide only an approximate match, to these impedances.

Retail price of the amplifier, which is available through Steanes Sound Systems, is £27/7/-.

A QUALITY CRYSTAL MICROPHONE by "HODGES"

MODEL 4C

An all-purpose Crystal Microphone incorporating an improved imported crystal cartridge and acoustic filter ensuring a response of 30 to 7,500 c.p.s. The streamlined case is die-cast in aluminium and finished in silver-grey hammertone enamel with polished chromium front grille. A moulded rubber ring provides a shock-proof mounting for the cartridge.
Price £7/10/-

Technical Pamphlet mailed on request. If unable to obtain from your Supplier, write direct to:—

HODGES SOUND SYSTEMS

Available from:—Leading Suppliers and Amplasound Co., 126 Buckingham St., Sydney (opp. Demco).
QLD.: A. E. Harold, 123 Charlotte St., Brisbane. S.A.: Scott Sales, 99 Currie St., Adelaide.

Precision Turned Aluminium Turntables and Shaft Complete.

Drop in replacement for MU14 and GU4 B.S.R. motors.
Eliminates wow and flutter.

£6/7/6, postage 8/6

Bearings can be supplied for above at 15/- each.

Agents for Crystal High Frequency Speakers.

A. F. KNOWLES

149 Union Rd., Surrey Hills,
E.10, Vic. Phone WX3602

AWA RONETTE

MICROPHONES & ACCESSORIES

Type 44

£5/17/6

Technical pamphlets will be mailed on request.
Other types also available from

CHANDLERS PTY. LTD.

ALBERT & CHARLOTTE STS., BRISBANE.
and leading wholesalers.

OFF THE RECORD — NEWS & REVIEWS

Wilhelm Backhaus is no stranger to Australia. His two visits centred round about 1930 will remembered by all who heard him play. He brought with him a standard of performan and a breadth of mind which even today are rarely equalled. He was just as happy playi Beethoven and Brahms as he was with Chopin — a master pianist in any company.

By JOHN MOYLE

And yet from a recording point of view, he hasn't been well represented. Maybe the competition was rather fierce, for he was the contemporary of men such as Schnabel, who just about cornered the works of Beethoven and Brahms, and of Gieseking, who perhaps was his nearest equivalent as an all-round pianist, specialising with composers such as Debussy.

Now, at the age of 70, Backhaus is recording for Decca in a series of Beethoven works, some of which I have heard this month. The strength and quality of his playing are amazing for a man of his age. If he has lost any of his technique and power, there is little evidence of it here, nor has the complete sincerity of his approach suffered in the slightest.

These records provide an interesting comparison and contrast with the work of many younger pianists whose names are found on the labels of records which are new since Backhaus commenced recording many years ago. His stature and maturity are unmistakable, and I doubt whether there is a better representative of the "classical" pianists to be heard today.

★ ★ ★

BRAHMS—Concerto No. 2 in B Flat Major, Opus 83. Played by Wilhelm Backhaus and the Vienna Philharmonic Orchestra, conducted by Carl Schuricht. Decca LXT2723.

From any point of view, this is an impressive record. The concerto is one of the biggest in the catalogue of big works — broad, strong, beautiful, a typical product of Brahms maturity. It's the kind of performance we would expect from a team who know exactly what to do about it. It lacks perhaps a little fire, but is not wanting in size and weight. Balance between orchestra and piano is exceedingly good. The soloist never underplays his part, but on the other hand there is no suggestion of that over-projection which spoils many of today's records, and which would be fatal here.

GOOD RECORDING

The recording is of a high standard. The orchestra is clean, with particularly good definition. The quality of its players is frequently demonstrated, as in the finely controlled 'cello solo in the second movement and the countless occasions on which the musical weave highlights various sections. There should be little trouble in accounting for every note in the score if you felt inclined to try. The surface noise is virtually inaudible and the reverberation time just right.

I can recommend this disc — it will take a mighty good one to pin it back.

★ ★ ★

BEETHOVEN — Concerto No. 2 in B Flat Major. Played by Wilhelm Backhaus and the Vienna Philharmonic Orchestra, conducted by Clemens Krauss. Decca LX3083.

Nowhere in Beethoven's music is the hand of Mozart more obvious than in this concerto. Only here and there can we see signs that the composer would inevitably move on to new fields of his own. It is a most charming work, untroubled and m dious, an excellent point of ent the field of classical music gene It is quite short — this version is plete on a 10-inch disc.

The performance is a model i way, clearly and firmly outlined an air of complete authority sh by both orchestra and soloist. yet I am reminded of that pee performance by Schnabel for F on the old 78's, a perfect exampl the difference between the two p ists. If you can compare the movement of these two records will, I think, be aware of that e verve and imagination which n Schnabel the magnificent Beethc player he was, and for which sacrificed so much in piano musi

And yet, maybe, such comparis are rather fruitless and perhaps fair to Backhaus. Schnabel is d and his records can't stand techn comparison with this one. We sho rather be thankful that thro Backhaus we can still hear a representative of his school.

★ ★ ★

BEETHOVEN—Sonata No. 3 in Major, Opus 2; No. 3; Sonata 17 in D Minor, Opus 31, No. Played by Wilhelm Backhas Decca LXT2747.

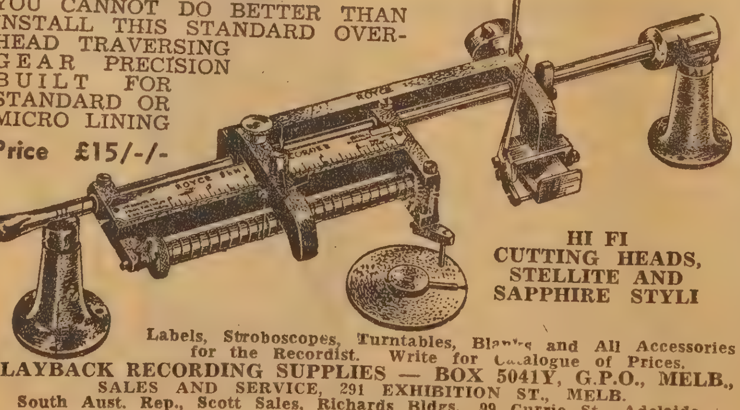
These are two important and c trasting works which form a g coupling for any disc. They repres Beethoven's early and middle peri a valuable addition to any library. 31 will, I think, be welcomed against, for instance, the "Appassic ata", perhaps the most popular those written during this period. liked it the better of the two—Bac haus seems happier when he h something to bite on. The earli work, I thought, showed too ma signs of his purposeful approach— remember a recording by Solom which to me exhibits more flexib and sympathetic treatment. Bac haus disposes of it somewhat sum marily when a little more gentlene would have been in order.

The recording is a good one, ar the surface is very quiet. A fin impeccable record which will greeted with respect.

★ ★ ★

TCHAIKOWSKY—1812 Overtur Hamlet — Fantasy Overtur Played by Wilhelm Backhaus monic Orchestra, conducted b Sir Adrian Boult. Decca LXT269

Not so often heard today on th concert platform is the 1812 Over ture — a rather painfully obviou and rowdy work but most spectacula if performed with all the stops ou That is exactly what happens here As a result we have perhaps the biggest and boldest 1812 ever recorded The same can be said of the Hamle Overture, which isn't nearly as wel



ROYCE
RECORDING EQUIPMENT
PHONE FB2592.
FOR HOME AND STUDIO
YOU CANNOT DO BETTER THAN INSTALL THIS STANDARD OVERHEAD TRAVERSING GEAR PRECISION BUILT FOR STANDARD OR MICRO LINING
Price £15/-/-
HI FI CUTTING HEADS, STELLITE AND SAPPHIRE STYLI
Labels, Stroboscopes, Turntables, Blanks and All Accessories for the Recordist. Write for Catalogue of Prices.
PLAYBACK RECORDING SUPPLIES — BOX 5041Y, G.P.O., MELB.,
SALES AND SERVICE, 291 EXHIBITION ST., MELB.
South Aust. Rep., Scott Sales, Richards Bldgs., 99 Currie St., Adelaide.

n. Technically this is a very record, the surface is quiet, the rding vivid and with good dyic and frequency range. If I in the market for this music, I t think I could pass it up. It really make your equipment out.

EETHOVEN — Leonora Overs Nos. 1, 2, and 3, with the Fidelio rture, played by the Vienna State ra Orchestra, conducted by Hern Scherchen. Westminster 5177.

uite a musical feast, this, and a icularly happy grouping. All se overtures were written for elio, but only the last is really to Beethoven's opera. The others eloped into virtual concert pieces. he story of the whys and wherees of the four attempts is long, olved, and with many gaps in the dence. It is well told in the cover otations, which, like all those m Westminster, are particularly ormative and well written. Only . 2 and 3 have any real resemnce to each other, and they are alike that most of us can be parned for mixing them up. Mostly y use the same material includ the trumpet call off-stage, but 3 is probably the best construct effort, and is the most often yed.

t is doubtful whether in all music have such a fine opportunity to npare a major composer's chang ideas, and to hear how he has rked on them to one end. This t alone gives the disc a unique peal.

All the performances are good, and ll played. Many music lovers will tempted by it.

MENDELSSOHN — Midsummer ght's Dream Incidental Music. SMETANA — Excerpts. Played by e Philharmonia Orchestra, conduct by Rafael Kubelik. HMV ALP1049.

This should be a popular disc, for material is widely known and pular, particularly the Mendelshn. The Overture, Nocturne, herzo and Wedding March are all re, most competently handled. The netana excerpts, too, are often ard, and lovers of the lighter side ill welcome them.

BEETHOVEN: Concerto No. 5 in Flat Major Opus 73 (Emperor). layed by Paul Badura Skoda and e Vienna State Opera Orchestra, nducted by Hermann Scherchen. Vestminster WL 5114.

Both orchestra and soloist show p very well in this version of the mperor. In the first movement, uadra Skoda shows much more fire nd enterprise than on other occaions, although he still exhibits some ind of inhibition which prevents im from "getting into" the music, s he must to produce the performnce of which I think he is capble. With a little bigger approach o a concerto of this kind he would e worth going some distance to hear, or his basic musicianship and abilty are without question.

Beethoven's slow movements are y no means easy to play. Without magination and a feeling for musial shape, this second movement can ecome a very pedestrian affair.

Technically the recording is quite OK, although the piano is, in my opinion, too forward. It is almost completely clean for all that, with plenty of weight and definition. The orchestra is fine, and the surface noise very low. It is in fact very similar in quality to the G Major concerto by the same group released some months ago.

BRAHMS: Quintet in B Minor for Clarinet and Strings, Op. 115. Played by the Vienna Konzerthaus Quartet with Leopold Wlach (clarinet). Westminster WL 5155.

This is a record very hard to fault. The Quintet is one of Brahms' last big works, one whose musical depths are never quite measured, whose beauty and understanding never fail to register, and to which we can return during a lifetime without monotony or disappointment.

Once more we have to acknowledge the musicianship of the Vienna players, who, to my mind, have never yet failed to produce a high quality record. The clarinetist shows fine sensitivity and control and plays with some lovely tone particularly in the lower register. A persistent and rather prominent G in the second movement is the only real quarrel I have with him.

The recording itself is forward and with excellent presence, but not so much as to spoil the balance of a five instrument ensemble. In fact, the balance is so well adjusted that, although once or twice the action of the clarinet is heard quite clearly in quickly-fingered passages, there are no lip sounds or other distractions to spoil the smoothness of the playing in general. There is a suspicion of an edge on the first violin occasionally, but it's hardly worth mentioning.

The surface noise is virtually nonexistent and the frequency is quite wide—on wide range equipment it sounds superb. There is no noticeable deterioration in quality at the record centre, and in fact no detectable flaws in reproduction at all. It is one of the loveliest records I have ever heard, and I strongly recommend it to you.

BEETHOVEN: Missa Sollemnis, Mass in D Major Opus 123, by the Vienna Symphony Orchestra, Akademiechor and soloists. Festival—Vox CFR 12-86 (2 records in album).

This is an enormous work from the period of the Ninth Symphony, and is not often performed in full. Despite its religious nature, one cannot help feeling that Beethoven was deeply interested in the musical possibilities of the Mass. One's reaction to it will depend largely on individual preferences. It is very long, but it undoubtedly contains some magnificent music.

DIFFICULTY OF BALANCE

The problems in recording such a complex score are many, and they are similar to those of the Ninth Symphony. The difficulty of course, is to achieve and preserve balance between soloists, choir and orchestra remembering that the soloists may be singing either together, alone, or in various divisions, that there are certain solo passages to be picked up from the orchestra which, with the choir, uses a wide, dynamic range, and that microphones can't be in two places at once even if it was desirable that they should be.

All these and many other matters should be remembered when being critical of the final result. The orchestra comes off best throughout by a wide margin. The choir and soloists perform somewhat remarkable feats of levitation with respect to the microphone, singing

(Continued on Page 97)

"For those who can *hear* *the difference"*

Your ear detects the subtle shading of a piano, clean brilliance of violins, the purity of a flute.

. . . yes, even the iridescence of clashing cymbals, the roundness of a clarinet, the mellowness of cellos. You can hear the difference for these are the thrilling new listening experiences released for your enjoyment by "Connoisseur".
The Connoisseur (reg.) in 3 speeds, 33 1-3, 45, and 78, full 12in turntable, is available with new lightweight pick-up (interchangeable heads).

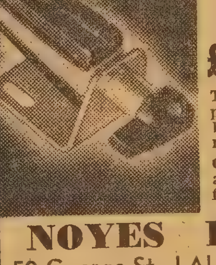
★ Due to import restrictions deliveries are slow. But please be patient!

J. H. MAGRATH & CO. PTY. LTD.
208 Lt. Lonsdale St., Melb. FB3731.

RADIOGRAM CHASSIS
5-Valve — 8-Valve
All makes, 3-speed Grammo Units available.
H.B. RADIO PRODUCTS,
5 Carrington St., Lewisham. LM5580.

RADIOGRAM CABINETS
Ten designs to choose from.
Send for Catalogue.
H.B. Radio Products
5 Carrington St., Lewisham. LM5580.

AWA RONETTE
MICROPHONES & ACCESSORIES



TO-284
Pick-up
Cartridge
£2/12/-
Technical pamphlets will be mailed on request.
Other types also available from
NOYES BROS.
59 George St., LAUNCESTON
and leading wholesalers.

Printed and published by Associated Newspapers Ltd., at the registered office of the company, 60-70 Elizabeth Street, Sydney, NSW.

ZEPHYR "90" SERIES DYNAMIC MICROPHONES

Australian manufacture throughout.

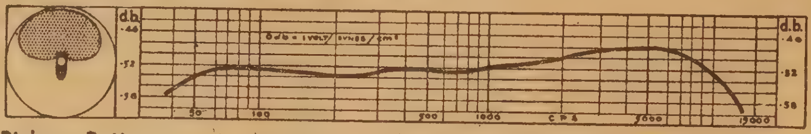
Designed especially for both wire and tape recorders, schools and P.A. work.

Precision built Moving Coil generator provides high quality reproduction, will withstand rough usage.

Modern appearance, extreme sensitivity at low cost.

Not adversely affected by temperature or humidity changes.

Lightweight, durable chrome and baked enamel metal case and swivel with full tilting head.



Pick-up Pattern   Approximate Frequency Response Curve

Model 90MA GRID-90MB 500 ohms-90MC 200 ohms **£11/15/3**, 90MD 50 ohms **£9/8/1** Retail.

STOCKED BY LEADING WHOLESALERS IN EACH STATE

IF UNABLE TO OBTAIN FROM YOUR DEALER WRITE DIRECT TO—

ZEPHYR PRODUCTS PTY. LTD. **PHONE U7248**

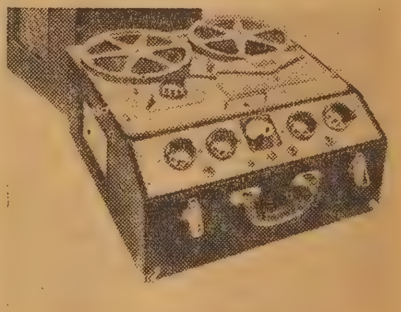
118 WATTLETREE RD., BOX 2, ARMADALE, SE3, VIC.

TRADE INQUIRIES INVITED FROM MANUFACTURERS AND WHOLESALERS

Ferrograph

Tape Recording Equipment

Setting the standard in Magnetic Recording!



On its introduction four years ago the Ferrograph set a standard in magnetic tape recorders that has remained the target of all subsequent designers. Now re-styled, Model 2A is presented in a physical form worthy of its technical excellence.

Basically the same robust, time-proven and reliable instrument, the new model 2A incorporates many refinements and facilities requested by discriminating Ferrograph owners and users.

No fantastic or exaggerated claims are made for the Ferrograph—indeed none is needed. Its reputation in the United Kingdom and abroad is such that it is justly denominated the standard by which all others are judged.

Synchronous Capstan motor. Improved response and signal-noise ratio. Simplified speed change. Provision for 1,750 reels, i.e. 45 minutes uninterrupted playing time per track at 7½in per second and 1½ hours per track at 3¾in. More convenient unit form for portability. Lighter in weight. Provision for Superimposition.

Hear the Ferrograph demonstrated at . . .

United Radio Distributors Pty. Ltd.

Radio — Electric Wholesalers **175 PHILLIP ST., SYDNEY** ***BL3954 (3 lines)***

6279

ATEST RECORD NEWS FROM OVERSEAS

ist month in this column I mentioned as a feature of recent American leases the wholesale issues of works by particular composers. Until ow, I do not think that it has been possible to make such an observation on the English lists.

By DISCOBOLUS

OWEVER, included in the releases by Decca for March is a es of LP's embracing all of the phonies by Vaughan Williams. London and Pastoral Symphon- had appeared previously, and e well received, and now the don Philharmonic Orchestra, er Sir Adrian Boult completes issue with the Sea Symphony, Nos. 4, 5, and 6.

lthough following directly on top the EMI release of the Sinfonia arctica, the Decca version in- des superscriptions to each move- nt spoken by Sir John Gielgud. ll recordings were made in the sence of the composer, who is rd in a short message at the end the 6th Symphony, presented in ndon's Kingsway Hall.

ORE OPERA

here is another spate of opera, h HMV's Carmen (Rise Stevens, Peerce, and the RCA Victor Or- estra), and Trovatore (Jussi rling and the same orchestra); cia di Lammermoor has appeared scheduled, on Columbia and ania, and now Tannhauser, also eased by NIXA from the Urania ginal.

HMV seem to be playing up Tos- nini for all they're worth. The est include the Beethoven 5th, on side of a 12in, with the 8th on reverse; Cherubini's Symphony D, Beethoven's Septet in E Flat, 20, the classical Symphony of okofiev and Gershwin's American Paris.

The Covent Garden Orchestra ys another Sylphides, and the ilharmonia Orchestra Schumann's rnaval. Myra Hess has recorded new version of Schumann's Piano ncerto for HMV, this time with Philharmonia Orchestra, which reviewers have treated very ndly, and Gioconda de Vito plays Brahms Violin Concerto, also for MV.

Decca's L'Oiseau Lyre lists still ature the lesser-known music to a eat extent, but their March re- ase is headed by Bach's St. John ssion.

OLUMBIA RELEASES

Columbia have the Symphony No. of Sibelius, four Hungarian Rhap- dies of Liszt (Louis Kentner), and 12in of Gieseking, playing De- ssy. Due very shortly on this bel is a new recording of Han- l's Messiah.

In America, Westminster have re- ased a number of new recordings chamber music, mainly early hubert, and two modern concertos Andre Jolivet, with a French chestra. American Decca now pre- nt on three discs the five Beethoven ano Concertos, all by Wilheim empff and the Berlin Philharmonic rchestra.

A number of tapes of Russian ori- n are reaching the American mar- et on Vanguard and Colosseum: there is evidently a curious copyright position on these tapes, as both companies offer identical performances and recordings of such items as the Brahms and Beethoven Violin Concertos, for example.

The Period company—released outside USA on NIXA—have also secured some of these tapes, although they are not duplicating the issues of the other two companies. Reports indicate that while the Russian tapes leave little to be desired in the way of artistry, they are not of the same technical standard as the Western recordings.

RCA Victor have issued a memorial album of piano works recorded by William Kapell, and have sponsored a new label, Camden, which will sell for 1.89 dollars per disc. The intention is to release early but well-known recordings which were originally on 78's, and some of which date back to the prewar days.

This company, along with American Columbia, have at last realised that there is a limited market for microgrooves which are nothing more than dubbed 78's, when the smaller independent companies can offer at highly competitive prices new performances and far higher standards of recording technique.

The old 78's may be accepted at the cut prices, and it is to be hoped that there will be an extension of this policy to the EMI group.

DISCARDS

There is a strong feeling abroad that large numbers of English releases have simply appeared to unload stocks of records which have not had a ready sale on the USA market.

At least it is fairly true to say that most of the English issues of discs of American origin are examples of very early microgroove recording, and some of the discs bear out this point.

"LP" has come to mean more than just "Long Playing." The public now expects to get Very Long Playing and the very best of High Fidelity. Not all the companies give these two.

OFF THE RECORD—NEWS & REVIEWS

(Continued from Page 95)

from either three or thirty feet within a very short space of time. Similarly, the choir and the orchestra appear to change places now and then, so that one or the other can more effectively hold the stage. The result is somewhat disconcerting, although not outside the bounds of mental adjustment.

The soloists I thought only tolerably adequate, and not very well-matched as a team. This may have something to do with Beethoven's handling of voices for which he set some tricky passages.

RATHER PATCHY

The recording in the main is quite good of its type, sometimes very good, but the overall effect is a bit patchy. There are no surface worries, and if the result is achieved with some effort, it is a very commendable one.

SCHUBERT: Die Schone Mullerin. Sung by Dietrich Fischer-Dieskau with Gerald Moore at the piano. HMV ALP 1036-37.

This song cycle and Schumann's Dichterliebe have much in common in their story of unrequited love, but not much else. Schumann's is much more dramatic than Schubert's, whose story of the Maid of the Mill is told rather as a collection of beautiful songs than a more or less cohesive procession of dramatic lieder.

The singer is a young man of about 28, with a six foot-plus personality, who is enjoying great popularity overseas. He has not only a most remarkably flexible voice, but an exquisite sense of song which makes him almost an ideal Schubert interpreter. His singing of No. 8—Good Morning, Lovely Miller Maid—is a perfect example and there are others of the same quality.

His voice, however, tends to become forced under pressure, in contrast to his beautifully controlled legato. When he must depart from it the effect is uneven and strangely explosive.

Gerald Moore's accompaniments are a delight to hear, and share the honors with the singer in my estimation.

The recording is quite good, although not brilliant, and there are a few surface clicks here and there.

You will recognise many of these songs, and you have rarely if ever heard them better sung. Some of them are Schubert's best, and they don't come any better.

ALWAYS RELY ON R.D.S.

R D S

SPECIALS FOR APRIL

1. 8 Mfd. Conds., 2/5 each.
2. RDS Kit Sets ready to wire, £9/19/6.
3. 5-Valve Chassis, £24/10/-.
4. Distributors for SEMAK Vitamizers.

We can supply all Radio and Electrical Components, and are agents for the Famous Hotpoint Radio Sets.

Distributors of Test Equipment, Valve and Circuit Testers, Multimeters, etc.

A Complete Mail Order Service for the Countryman.

CALL, WRITE OR PHONE

RADIO DESPATCH SERVICE

Radio and Electrical Distributors,
GROUND FLOOR, WEMBLEY HOUSE,
841 GEORGE ST., SYDNEY.
Phone MA1876. Open Saturday Mornings.

SHORT-WAVE NOTES BY ART CUSHE

Broadcasting plays a vital part in the development of the British Colonies, and some 33 services are now in operation, broadcasting to 74-millions.

COLONIAL broadcasting, for which the BBC should receive much credit, has now developed so that nearly every British colony has some broadcasting organisation, reports London Calling. Only four years after the BBC commenced to operate, in 1922, Georgetown, British Guiana commenced to operate on short-wave. In 1927 Kenya joined the short-wave broadcasters, and in 1929 Radio Hongkong, one of the best of the early colonial stations, took the air. Sierra Leone commenced transmissions in 1934, and in 1935 the Gold Coast, as well as Gibraltar, Malta, Barbados and Fiji.

This activity in the colonies resulted in the BBC commencing to train technicians in London, with the co-operation of the Colonial Office. Many well-known BBC technicians have left London to work on the operation of these new stations, and to get the personnel trained.

SOLOMONS THE LATEST

The latest newcomer to the colonial service of broadcasting stations is the Solomons, and station VQO, Honiara, commenced operation last year on Coronation Day so that some 600 listeners in the area heard this famed broadcast. This station was built by the local radio officer from two war surplus transmitters left after the evacuation of the colony. During the war the Solomons had its own station for the forces, and WVUQ, Guadalcanal, was a well-known broadcaster in the late 1945 period.

In the period from 1940 a new station in the colonies has been put into operation in Lusaka, Northern Rhodesia. Some million pounds have been put aside for broadcasting organisations, and from this fund many improvements have been made. Seychelles, and Tanganyika, are two of the most recent areas to gain a grant and commence to operate, while last month in this page we mentioned the new Uganda station.

British Honduras now has a new station, broadcasting in Spanish and English, while Cyprus, which for many years has been the home of the Arabic broadcaster Sharq el Adna, has its own broadcasting station which carries programs in English, Greek and Turkish. The "saucepan" receivers made for listeners in Africa, and sold to them at a very low figure, gives the Central African Broadcasting System some 50,000 African listeners each evening.

Colonial stations certainly have a bright future. Since 1949 some £3-million has been spent on new stations in 27 colonies, in establishing new stations, and improving existing facilities. These stations employ a total of over 2000 persons and have over 2500 program hours each week.

NIGHT RECEPTION POORER

SUMMER reception conditions, which lend to excellent signals from Europe on the 13, 16 and 19 metre bands, are fast fading out, and this month will find many stations making frequency changes and transmission changes to suit reception in this area. March saw the dropping of 17860 Kc by ORU, Brussels, in the 8 pm session to Australia, and the transmission is now carried on 15335 Kc. Signals are good, but some interference from Philippines-2 on 15330 Kc, opening also at 8 pm, spoils otherwise good signals.

Hilversum are expected to commence the afternoon coverage of this area, for the winter period, as from April 1, when they will operate 12.30-1.10 pm to this area on 11730, 9590 Kc. The present 8.30 pm transmission will then be deleted.

Radio France Asie; which for the past few months has been providing excellent signals on 15430 Kc from 6.45 pm daily, is expected to revert to 9750 Kc shortly, which will enable them to provide year-around reception in this area. For the past two years, since the new frequency was suggested by the writer, they have found it gives excellent results in Australasia, but though reception is possible in Western Australia over the whole of the year, listeners farther east find signals from Saigon just can't be heard during a period of midwinter.

The British Far Eastern Broadcasting Service, in Singapore, with relays from the BBC's General Overseas Service, will enable programs from London to be heard through the winter, with their rebroadcasts, programs which otherwise could not be heard direct from London.

NOTES for the next issue should be sent to Arthur Cushen, 212 Earn St., Invercargill, NZ. All times are Eastern Australian Time.

NEW TOKIO SCHEDULE

RADIO Japan, Tokio, is now operating on a new schedule which will remain in force to April 30. The main change for Australian listeners is the dropping of the 31-metre outlet on 9695 Kc and replacing it by 15135 Kc. The complete schedule is:—

To North America: 3.0-4.0 pm on JOA3 (9695), JOB4 (11780). To Hawaii: 5.0-6.0 pm on JOA6 (15135) and JOB4 (11780). To Australia and New Zealand: 7.0-8.0 pm, JOB6 (15135) and JOB6 (11735). To North and Central China: 9.0-11.0 pm, JOA3 (9695) and JOB2 (7180). To Philippines-Indonesia: 11.30 pm-12.30 am, JOA3 (9695) and JOB6 (11725). To Indo-China, Burma, Thailand: 12.45-1.45 am on JOA3 (9695) and JOB6 (11725). To India-Pakistan: 2.0-3.0 am, JOA3 (9695) and JOB6 (11725). To Europe: 5.0-6.0 am on JOA3 (9695) and JOB2 (7180). To South America 8.0-9.0 am on JOA6 (15135) and JOB6 (11725).

In most of the transmissions English news is presented on the opening of the program, and in the Australian transmission at 7.12 pm the features include Trade and Economic Topics (Monday, Friday), Facts About Japan (Tuesday, Thursday, Saturday), My Story (Wednesday) and Sports Topics (Sundays).

FLASHES FROM EVERYWHERE

RADIO SWEDEN'S latest schedu
cludes the use of 15155 Kc for the
tralian transmission at 2.0 pm
The complete schedule which is in
to the end of April is: To W
USA, 7.0-8.0 am, 3.0-4.0 pm on 953
Eastern USA, 10.0-10.45 pm on 1515
South America, 9.0-9.45 pm on 1515
and 8.0 am-noon on 9535 Kc; A
3.0-4.0 pm, 4.0-4.45 am on 11705
Middle East, 3.0-3.45 am on 11880
South America-Australia, 2.0-2.45 p
15155 Kc, midnight-2.0 am on 11880
Far East, 9.0-9.45 am on 9620 Kc,
11.15 pm on 11880 Kc, reports the Sw
DX session, which is still being
ceived at good strength at 5.20 pm
Saturdays on 6065 Kc.

RADIO DAKAR, Senegal, is rep
by Rex Gillett, Adelaide, as being h
after WRCA vacates the 11890 Kc
quency at 8.15 am. Dakar can be h
on 11890 Kc to sign off at 8.30 am
the French National Anthem.

LONDON'S latest frequency in the
75M band is 3955 Kc, which is now
with General Overseas Service broad
at 6.0 am, with a relay of BBC n
London's 3975 Kcs outlet is also h
at the same time with broadcasts
European languages. Also in this b
on Sunday mornings, listeners will
the Indonesian station, YDL, 3960
with YDA3, 4945 Kc, operate to 6.30
The program is of dance music and si
strength is good on both frequenci

TANGIER'S latest station is The V
of International Evangelisation, Box
Tangier, which is being heard in Swe
with test broadcasts on 7250 Kc from
to 7.0 am daily, and on Sundays a
pm. Reception reports are reques
and station identification is given
English and Spanish. Another Tan
station, Pan American Radio, which
mally operates on 7290 Kc, has
using 9540 Kc from 6.0 to 7.0 am. R
Pan American, which claims to be
only commercial station in the w
broadcasting in six languages, ca
commercial programs beamed to liste
in Europe.

LABRADOR'S CKA32, which was
merly VNOW, is one of the most ren
of the short-wave stations operating
day; CKA32 operates on 3420 Kc
75 watts. The station is operated
the Labrador Mission of the Un
Church of Canada and mainly bro
casts programs for children in isola
areas. The full schedule is not kno
but reception of this station would
highly improbable in this area.

FROM THE MAILBAG . . .

RADIO Banderantes, Station ZYR78, R. Paula Souza, 181, Sao Paulo, Brazil, verifies reception of this station's broadcasts on 11915 Kc with a letter in English from Snr. Samir Ruzak, secretary. ZYR78's transmitters are located at Vila Vera, outside Sao Paulo, and the broadcasts are also carried on ZYR77 (6185), also to sign off 3.30 pm daily.

SIRA (Servicio International Radiofonico, Argentine), Buenos Aires, confirms reception of the LRA transmitters, with a card showing a photo of downtown Buenos Aires, with verification details on the back. In an accompanying letter, Snr. Jose Oscar Landi, director, expresses his regret at the delay in issuing verifications from SIRA. Some of the reports which he verified for the writer were 1950 loggings. Landi explained that SIRA since its inception had been overburdened by mail in the
English language section, with consic
able delay to all DX reports.

Reports sent by listeners to LRT (Ra
Tucuman), LRS (Radio Splendid),
LRY (Radio Belgrano) had been
warded by these stations to SIRA
handling, due to the fact that the for
stations have no English staff. Natura
SIRA without any logs from the
tions concerned can do nothing with
matter. DXers are, therefore, urged
when they log these stations, reports
sent in Spanish. The writer will
pleased to help any of our readers
this type of report form.

Nordwestdeutscher Rundfunk, Hambu
now operating on 6075 Kc with 500
verified reception in less than 20 days
the new station, which we reported
issue. The station is still being he
at fair strength on 6070 Kc with sli
side interference at 5 pm from Sto
holm, operating on 6065 Kc.

HE HAM BANDS WITH BILL MOORE

MATEURS RISE TO EMERGENCY IN COASTAL CYCLONE

adio amateurs played an important part during February in handling relief messages from ooded areas on the North Coast of NSW. Often they provided the only link with the outside ith normal communications shattered, railways damaged and all roads flooded. They passed newspapers the first news of the devastation wrought by cyclone and flood.

ING flood emergencies, radio ama- urs on the North Coast of NSW have history on a number of occasions e emergency working field in Aus-

nid-February of this year, they were cord an even greater achievement ever before and show the public the of amateur radio in times of dis-

flood and cyclone was the most tating on record extending in the from the Tweed River, 350 miles to the Hunter. The northern sector nost affected, with a loss of 23 lives lamage to the extent of millions of ds.

TICAL PERIOD

noted in previous working, the first 24 hours was the period when ama- can supply, when other facilities fail, nunication to the outside.

nage to normal communication cir- was widespread and in most areas it some days before they were restored. was in this initial period that ama- relayed first information of the station and requests for relief from es at Tweed Heads, Kyogle, Murwil- ah. Casino and Lismore.

tions from many locations within the ken area operated for varying periods 4 pm Saturday, February 20. to 10 on February 23.

ndreds of Press and other mes- were handled. For some days a ter period amateur stations were still e relaying messages from "Ducks' lying relief in the area.

rious authorities and amateurs in parts of the Commonwealth and New and co-operated to do sterling work, the whole operation reflected great t on the operators participating and ne hobby in general.

is extremely difficult to estimate the parative value of the work of indi- al operators in these emergencies person concerned is the only one who judge whether he is best employed ne air at length or assisting in other

om this angle, the operator who is active for a short period may sacri- most to contribute to the net work- The operation was so widespread on occasion and so many channels were se, it was practically impossible to n a complete picture of the proceed-

O BANDS

affic was handled mainly on the 7mc by day, and 3.5mc band by night. as directed in the initial stages from flooded area to VK2WI and the WIA rgency net and at other periods to ous amateurs in Sydney and New- e.

net ran practically continuously on kc/s handling messages to and from AA, official PMG station at Middle d, Sydney.

e PMG emergency frequency of 5390 was also in use.

considerable amount of traffic was ed crossband from the 7 and 3.5mc/s ds to 6915 and 3252 kc/s, the NSW ce Department's emergency frequen- where VKG Sydney and VKG3 New- le were operating.

other cases amateurs operated ex- ively on these police frequencies in s where suitable xtals were held by l police authorities.

opagation conditions on the occasion e not very good, skip causing confusion at times. The low static level in 3.5mc/s during the weekend did, however, greatly assist communications.

Messages were handled by amateur stations for many authorities, including the Police Department, Social Services Department, Railways, Army, PMG Department, local members of Parliament and public utilities.

Stations operating from the flooded areas included: Bill Campbell VK2ZY, Norm Carpenter VK2RK, Steve Grimsley VK2VK Charlie Miller VK2ADE, Ron Martin VK2AHI, Dr. Tom Hewitt VK2LH, Roy Berry VK2NY, Peter Rudder VK2TB, Terry Spence VK2AJS, Crieff Retallick VK2XO, Alex Goldie VK2TG, Bill Eagling VK2AEY, Jack Gerard VK2ADN, Bill Grant VK2AWG, Bill Allworth VK2OE, Allan Simpson VK2ASO Peter Alexander VK2PA, Noel Hansen VK2AHH, Bob Wilkins VK2WQ, Geoff Switzer VK2SR. A number of the above stations handled considerable batches of traffic, some were badly flooded, while other stations in the area could not operate at all, due to damage to their homes.

The operation commenced at 4 pm on Saturday, when VK2ADE of Casino opened on 7mc/s requesting a link with Sydney, as normal communications were affected. This request was relayed to VK2WI by Graham Hall VK2AGH and Andy Kerr VK2AX. Jim Corbin VK2YC then opened official station VK2WI to provide the Sydney link.

EXTRA STATIONS

Shortly afterward, VK2LH joined the link from Lismore, as normal communications from that town were disrupted. Syd Smith VK2APS opened from Tamworth to represent Police Hqrs. for the North Coast, which is located in that town. These stations were assisted by many others and at one stage ZL2HV joined the net and relayed messages which were often graphic and important.

The frequency was changed during the evening to 3725 kc/s and Dr. Alex Dan VK2ABU took over the operation of VK2WI, assisted by VK2YC.

At 11 pm, VK2LH lost his local AC power, and as he had lent his mobile emergency equipment to Alf Webb VK2UC to use in another part of the town, he was forced to close. During the many blackouts experienced during the evening in Lismore, landline was used to clear messages to Casino. VK2ADE then relayed them to the various nets.

At 2 am, the Casino link was taken over by the police through VKG and VKG3, and VK2ADE changed to 3252 kc/s, later returning to the amateur bands.

On the police frequencies were Moore Park (Army authorities), Port Macquarie and West Kempsey. The latter two were, in fact, Peter Alexander VK2PA and Noel Hansen VK2AHH using their own amateur equipment on these frequencies.

VK2PA was assisted by Lew Smith VK2AWS. They covered vital points and handled considerable traffic.

On Sunday morning, activity increased considerably on amateur bands. At one stage three nets on 7002, 7020 and 7050 kc/s were in operation beside the police frequency of 6915 kc/s. VK2AJS of Grafton was operating passing important railway traffic via VK2AYP in Sydney.

Also active from Grafton were VK2NY, VK2OE VK2TB, and VK2SR, until the loss of AC power forced them off the air, VK2NY and VK2TB's homes were badly affected by flood. VK2OE also manned the police link from Grafton.

VK2AA was busy on 7002 kc/s directing telegrams to VK2AHI in Casino who operated up to 20 hours a day receiving and relaying PMG telegrams. VK2AJS operated on batteries at one stage when power failed.

VK2XO from Raleigh operated for periods to transmit official traffic. He was badly flooded at his QTH and was usng 2 watts to portable equipment. He was reported at one stage to be using a broom to keep a bull swimming outside from climbing on to his veranda. At Bellingen, farther up the Bellinger River, VK2TB used 7 mc/s at times, but lost his power fairly early in the operation; later he and Percy Sara VK2QV operated with a No. 11 set.

From Coffs Harbor, VK2ADN and VK2AWG appeared at various intervals assisting the net, as did "Dorrigo" manned by a PMG official the latter transmitting messages to Ron Stuart VK2ASJ, Newcastle, for relay to VKG3.

Ballina was represented by "VK2N", an operator who obtained a transmitter from a local authority and transmitted on amateur bands and police frequencies.

MESSAGE OF THANKS

At the conclusion of the operation he directed a message to the WIA Emergency Net thanking them for the valuable work performed.

The first news of the devastation in Murwillumbah was transmitted by VK2RK, The town had been out of communication with the outside for 18 hours. Norm passed Press to a reporter at Max Sobels VK2OT, at Newcastle. Later he cleared many telegrams from VK2AA.

Previously VK2ZY, of Murwillumbah, was operating, but was isolated from the town proper by floodwaters. Six inches of water was in the shack. Bill casually announced the arrival of an additionl house on his property.

With the passing of the first news from Tweed Heads, Steve Grimsley VK2VK performed a similar service to that of VK2RK for Murwillumbah. Press messages giving details of the damage were sent to VK2AGH Sydney.

VK2LH of Lismore was again operating on Sunday, but Tom's medical duties allowed him little time on the air.

VK2ASO on the Monday sent out the first news of Kyogle's damage. He handled, too, considerable traffic from VK2AA. VK2AEY of Taree operated on both the 7mc/s band and police frequencies.

Later in the operation, VK2PA transmitted weather and traffic to VK2EL in Sydnev.

GUARD STATIONS

Valuable work was performed by many stations in keeping net frequencies clear.

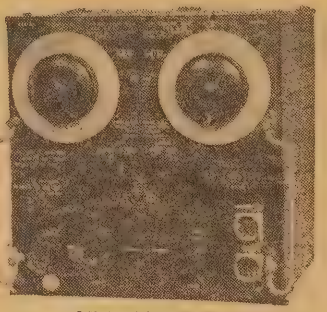
In New Zealand this guard work on the 3.5 mc band was performed by the NZART Amateur Emergency Corps after a request to official monitoring station ZL4OA. VK2AJO was also officially requested to act as guard station here in view of the excellent coverage of his signals on the 3.5 mc band.

The last net operating was closed at 2000 hours on Tuesday.

VK2ADE and VK2APS were using 3725 kc/s working crossband to VKG on 3252 kc/s.

VK2AJO relayed to the two NZ guard stations then active, ZL3JT and ZL2IJ, a message to the NZART from the NSW Police thanking them for the assistance rendered in keeping 3725 kc/s clear for emergency working.

MOTOR SPARES LT

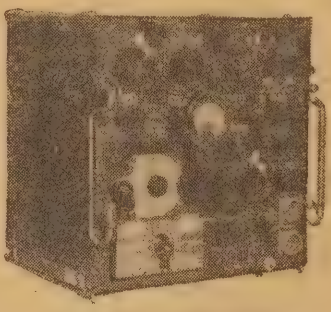


AR8 RECEIVER

In good condition with all valves. Eleven 6.3 volt standard octal valves used as follows:—
3—6A86, 4—6U7G, 1—6J7G, 4—6B8G, 1—6X5, 1—6J5.
This set makes an ideal communication receiver covering all frequencies from 140 KC to 20 MC. An AC supply could easily be fitted if required.

Price £19/10/-

Price Less Valves and Covers £11/10/-
Weight 32lb.

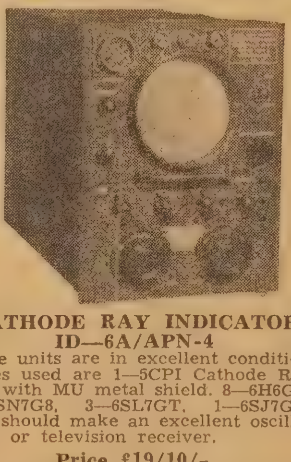


AT5 TRANSMITTER

In good condition with all valves. Frequency coverage 140 KC to 20 MC, provision for 6 crystals.
Valves used:—2—6V6, 3—807 Valves.

Price £9/5/-

Price less valves £5/15/-
Weight 32lb.



CATHODE RAY INDICATOR ID—6A/APN-4

These units are in excellent condition. Valves used are 1—5CPI Cathode Ray tube with MU metal shield. 8—6H6GT, 14—6SN7G8, 3—6SL7GT, 1—6SJ7GT. This should make an excellent oscilloscope or television receiver.

Price £19/10/-

Weight 40lb.

RADIO CONTROL BOX BC 450A

This is a triple remote control consisting of 3 Vernier controls, 3 potentiometers. 6-3 position switches, 4 phone jacks. These units are designed to control the command receivers.

Price 17/6 Weight 2½lb.

★ SPECIALS ★

1. Model RU-13 Dual Coil Units consisting of 5 coils and two position switch switching each coil. These are plug in units and fully shielded.
Frequencies available.

A { 195—290 KC) 290—351 KC)
B { 201-398) 4150-7700)
C { 540-830) 3000-4525)
D { 400-600) 600-9050)

All at 3/6 ea.

Single coil units of 5 coils, no switch 2500-4700 (E) 850-1330 (F) at **2/6 ea.**

2. 5 inch Permag Speakers heavy magnet with good cones. 15/- each.
With damaged Cones. .... **3/6 ea.**

3. 12 volt Vibrator power supply. This unit will give sufficient 2 volt A. supply, 135 volt B. supply and C Bias for an average 5 valve battery receiver. Ideal for use on farm light plants, or in boats, caravans, etc.
Worth £12/10/-. Our price .. **£3/15/-**

4. Semi Rotary Switches available as follows:—

A. 3 pole 3 pos. 2 Bank	**3/- ea.**
B. 3 pole 3 pos. 3 Bank) C. 4 pole 2 pos. 3 Bank)	**4/- ea.**
D. 2 pole 4 pos. 4 Bank	**5/- ea.**

★ SPECIALS

5. Red Indicators with screw plastic lens, front load type wi M.E.S. Holder and bakelite boc Worth 7/6. **Our price 2,**

6. Phone Jack small single circu type **2/9 e**

7. Metal Valve Boxes size 5 5/8in 5 5/8in x 6in with hinged lid ar carrying handle made of heavy ste sheet and sprayed khaki, suitable fc tool boxes, etc. Worth 10/-.
Our price 3/

8. Well known brand of 6 inch perma speakers with 5000 ohm transforme Brand new and boxed. Worth £2/10/
Our price 30/- ea

9. Best known make of Englis Speakers permag 6inch with 5000 ohr transformer. New and boxed **35/- ea**

10. Dry Metal Rectifiers meter typ suitable for 0-1 or 0-5 ma meter Brand new. Worth 37/6.
Our price 25/

11. 250 ohm rheostat 25 watt wir wound on Mica with porcelain insulation. **4/6 ea**

12. High frequency stand off insulato with 3/8 inch bolt 6½ inch long tc attach to wooden post, etc. Insulatin material is glass with clamp to attac aerial rod or transmission line to insulator. **Only 3/- ea**

13. Baffle Boards size 24in x 18in made of heavy polished Plywood, very suitable for amplifier work, using 8in speakers. Worth 30/-. **Our price 15/-**

15. Jones Plugs in perfect condition.
12 pin **8/6 pr.** 8 pin **5/9 pr.**

NOTICE

All parcels sent registered post unless otherwise stated. Postage or freight must be included with order.

Job Condensers:—The following condensers are available, many are ex British Navy and all can be thoroughly recommended.

Cap. Mfd.	Type	Votage DC	Price	
.0001	Silver Mica		6d ea.	4/6 doz.
.001	Tubular Paper	1000 wkg.	6d ea.	4/6 doz.
.005	Tubular Paper	1000 wkg.	8d ea.	6/- doz.
3 PF	Mica		3d ea.	2/6 doz.
5 PF	Mica		3d ea.	2/6 doz.
.01	Bakelite Tubular	1000 wkg.	1/6 ea.	15/- doz.
.0002	Mica	1500 wkg.	8d ea.	6/- doz.
.0004	Mica	1500 wkg.	8d ea.	6/- doz.
.1+.1+.01	Star Paper Tubular	2250 test	1/- ea.	
2 mfd	Electrolytic	500 wkg.	1/- ea.	
50	Electrolytic	12 wkg.	6d ea.	
.1+.1	Block	1500 test	1/3 ea.	
25	Block	1500 test	1/- ea.	
.01	Metal Tubular	375 wkg.	9d ea.	7/6 doz.
.0023	Mica	500 wkg.	1/- ea.	
1	Block	500 wkg.	1/3 ea.	
1	Block	800 test	1/3 ea.	
8 x 8 x 8	Electrolytic	450 PV	3/3 ea.	36/- doz.
50	Electrolytic	50 wkg.	9d ea.	
500	Electrolytic	15 wkg.	1/- ea.	
30	Block	100 wkg.	2/3 ea.	
1	Tubular Metal	375 wkg.	1/6 ea.	
250	Block Electro	25 wkg.	9d ea.	
.5	Oil Filled Block	8000 test	4/6 ea.	48/- doz.
.1	Block	4000 wkg.	4/6 ea.	48/- doz.
1	Block	500 test	1/6 ea.	
.25+1.8+1+1	Block	500 wkg.	3/9 ea.	
.5	Block	1500 wkg.	3/- ea.	
.02	Block Mica	300 wkg.	1/- ea.	
.1	Tubular	350 wkg.	9d ea.	
.1	Block	800 test	9d ea.	
.1	Block	500 test	9d ea.	
.03	Metal Tubular	5000 wkg.	3/6 ea.	
.055	Block	2500 test	1/6 ea.	
.5	Block	2000 test	1/9 ea.	
.5	Block	500 wkg.	1/- ea.	
.25	Block	2000 test	1/6 ea.	
.25	Block	2500 test	1/9 ea.	
.25	Block	2500 wkg.	4/6 ea.	
.25	Block	2000 wkg.	4/- ea.	
1	Block	1500 wkg.	5/9 ea.	60/- doz.
16	Tubular Wet Electrolytic	350 PV	3/- ea.	
4	Block	600 wkg.	10/- ea	

547 ELIZABETH ST., MELBOURNE ALSO AT — ALBURY ARARAT BAIRNSDALE BALLARAT
BENALLA BENDIGO BROKEN HILL COLAC DANDENONG ECHUCA SALE FRANKSTON
GEELONG MILDURA SHEPPARTON ST. ARNAUD WAGGA WANGARATTA WARRAGUL

channel was again opened for a
period, and the final sign-off was
hours.

ie, as he termed it, "Pulled the
itch" after 78 hours of practically
ious operation, a fine record of
service.

ugh it is diffcult to differentiate
n the working of so many stations,
lt special mention should be made
work of Charlie Miller VK2ADE,
lewitt VK2LH, Ron Martin VK2AHI,
Carpenter VK2RK, Steve Grimsley
K, and Allan Simpson VK2ASO,
operating achievements from the
affected areas will be long remem-

nentioned previously, many stations
e the stricken area assisted in keep-
e emergency channels clear, some
noted being VK2AVG, VK2WT,
CP, VK2QQ, VK2AQH, VK3BH,
O, VK2PQ, VK2ZX, VK2ARG and
others. Assistants in the shack
l important parts in keeping the
ge hooks clear, VK2LH, for instance,
ssisted by VK2AEU, while at other
s police officials were constantly
ty.

UABLE LESSONS

general consensus of opinion is to
ffect that several valuable lessons
learnt that should assist in future
gency operations. On this occasion,
areas were seriously damaged than
evious floods, and to clear the traffic
y from these areas a number of
was necessary. Any idea of future
tion using one frequency, 3501 or
kc/s, for instance, would not be
. It would appear that mobile equip-
should be designed with some form
pid frequency variation in the trans-
r.

ateurs generally were disappointed
e lack of publicity given to their work
e daily Press. Of the 23 stations oper-
(exclusive of 5390 kc/s) from the
ed area, 20 were manned and equip-
by amateurs, and due credit should
been given to this point.

ough messages the Press handled
official, these were only transmitted
acilities afforded by the amateur,
any cases at considerable inconveni-
and financial loss to the individual.

appeared from Press reports that
c was handled via official police and
stations.

e broadcasting stations were some-
kinder and gave credit to the work
e radio amateur. The ABC in the
onal News gave an excellent review
e amateurs' emergency working on
following Saturday.

other point that would assist the
orities finally handling the messages
Press reports would be if listeners
he nets refrained from telephoning
ages to these authorities.

a receipt to a message is given by
station, it can be safely assumed that
message will be duly forwarded to
appropriate authority.

the transmission heard is in the form
"QST" then, and only then is it
ssary to act and relay such message.
times there were hundreds of listen-
to these emergency nets and it re-
es only a few persons to decide to
e messages heard to cause consider-
inconvenience.

stwar radio amateurs in all States
e Commonwealth have at times per-
ed emergency work of importance,
this latest operation of stations on the
th Coast of NSW in February can be
ed to this list, further to demonstrate
in peace or war they can prove of
e to the nation.

NTEST NEWS

ntests conducted during February in-
ed the WIA's National Field Day and
ARRL's W/VE DX contest.

he national field day, judging from
ion activity, was well supported, especially by VK3 amateurs. Conditions were rather poor, with an extremely high static level on 7 and 3.5 mc/s. The weather in NSW was bad, stations in the field operating through continuous rain.

The NZART held their portable station contest over the same weekend, and some NZ stations in the contest were putting excellent signals into Australia with only a few watts.

The first weekend of the Telephony section of the W/VE DX contest provided the best signals from American stations on the 7mc band, the only problem being to separate them from the solid mass of heterodynes.

One needed a very good receiver. Don Wallace W6AM, from his antenna farm, supplied the outstanding signal. 28mc was open for a period during mid-mornings and 14mc provided the best signals around 0800 hours EAST.

In the first weekend of the CW section the 3.5mc band was used with considerable success by a number of VK stations.

W signals were possibly the best heard to date, and signal reports of S6 were common, with an occasional S8. On the Saturday evening, from 1900 to 2300 hours, signals were received at good strength, but the static level was high. On the Sunday night, static was down, as, unfortunately, were the signals. W8GHW supplied the most consistent East Coast signals, with W6RW the strongest West Coast station.

Last year Australian section winner was Lyle Woolnough VK2GW and he was contacting W stations at a rate of 15 per hour at one period, a good rate for the 3.5mc band.

Both CW and Telephony sections are conducted over two weekends; the second sessions were conducted in March.

YOUR OPPORTUNITY

oin the world-wide ranks of amateur
smitters! The Wireless Institute of
tralia holds regular classes in Sydney
ssist Sydney and suburban enthusiasts
btain their Amateur Operator Certi-
te of Proficiency.

**te for particulars to the Class Man-
r, W.I.A., Box 1734, G.P.O., Sydney.**

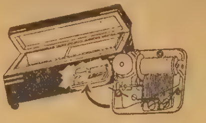
BEAR BRAND TAPE IS BEST VALUE
SEAL LUNCH WRAPS
COVER ROUGH EDGES
SEAL PERFUME BOTTLES
YOU GET 20 EXTRA INCHES IN THE ½" ROLL!
AND THE PRICE IS STILL THE SAME AT 1/9d.
BEAR BRAND CELLULOSE TAPE

It's the size your shopkeeper uses himself. In addition, because it's made here for Australian conditions, "BEAR TAPE" seals better, mends better, holds faster. "BEAR TAPE" ½" x 200" rolls, in coloured plastic dispensers, cost only 1/9 each everywhere. It's the best tape buy in Australia.

BEHR-MANNING, makers of the famous "BEAR TAPE," are also the largest manufacturers in the Southern Hemisphere of high-quality Sandpapers, Pressure-sensitive Tapes, Adhesives and Coatings, as well as being makers of "PROOFKOTE."

Y78a

Now you can make your own music box with these Swiss music units. They can be fitted to any type of box doll jug, teddy bears, etc. Hours of enjoyment for all the family.



30/-
EACH

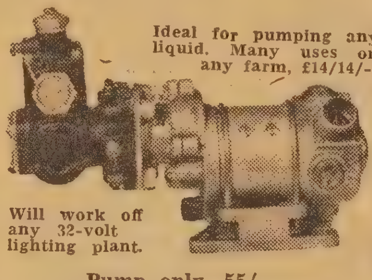
Tunes available, Lili Marlene, Teddy Bears Picnic, Jingle Bells and Blue Danube, Harry Lime Theme, Wedding March, The Merry Widow, Parade of the Wooden Soldiers, One Enchanted Evening, John Peel, etc.

ARMY FLUTES

39/6

Ideal for School Bands.
Never before at this amazing price.

Aircraft 24 volt Motor complete with 400 gal. per hour Pump. Made In America.



Ideal for pumping any liquid. Many uses on any farm, £14/14/-

Will work off any 32-volt lighting plant.

Pump only, 55/-.

SPECIAL DISPOSALS METER OFFER.

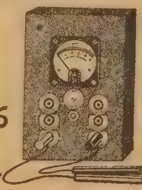
MILLIAMPERES

0-10 amp meters, AC-DC, 2¼in dial,	45/-
0-1 milliamp, 2½in dial	37/6
Weston 0-50 volt 0-100 amps combined M/coil,	£3/10/-
English 50-0-50 Ammeters, M/Coil	37/6
Eng. 0-50 Ammeters AC-DC	42/-
English 0-20 Voltmeters, M/Coil	25/-
English 0-40 Voltmeter, M/Coil	25/-
English 0-300 AC-DC Voltmeters	55/-
English 0-5 Milliammeters, 2¼in	27/6
English 0-150 Milliammeters, 2¼in	30/-
English 0-25 Ammeters, 2½in M/c	30/-
English 0-10 Ammeters, 2¼in dial, Moving Coil	45/-
English 0-30 Voltmeters, 2½in dial AC-DC	42/-
Eng. 0-40 Ammeters, 2¼in dial AC-DC	42/-
Eng. 0-50 Ammeters, AC-DC	42/-
Eng. 0-3 Ammeters 2¼ dial, AC-DC	45/-
Eng.. 0-150 Voltmeter, 3in Dial, Moving Coil	39/6
Eng. 0-500 Micro Ammeter M/coil	37/6
Eng. 0-150 Ammeter, 3½ Dial, AC-DC	75/-
Eng. 0-20 amps, 2in Dial, M/c	25/-
Eng. 0-1½ Milliamps, 2in Dial, M/c	19/6
Eng. 0-20 Milliamps, 2⅜ Dial, AC-DC	17/6
Eng. Multimeter, reads ohms and volts	35/-

AIR MIN. MULTI TESTER TESTS OHMS and VOLTS

COMPLETE WITH TEST PRODS

£5/17/6



Reads
0-10 Volts,
0-50 Volts,
0-250 Volts
Also
0-10,000 Ohms.

BALL AND SOCKET INSPECTION MIRRORS

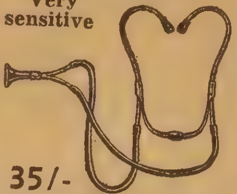
8/9
each

Ideal for mechanics, radio repairs, dentists, etc.

MECHANICS' STETHOSCOPES,

Ideal for Testing Engines, etc.

Very sensitive

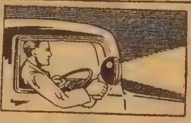


35/-

SURPLUS

512 Elizabeth St., Melbourne,
'Phone: FJ5904. Just 4 d
Mail Orders Carefully Pac
Please Add Freight or Postage

At Last! The spotlight you have been waiting for.



63/6

Complete with flex and switch.

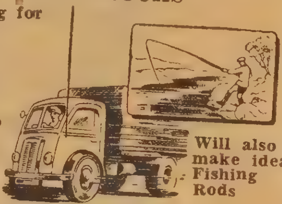
Fitted with genuine American sealed beam 6-volt globes. No motorist or boat owner should be without one.

Ideal for Fo
or Rabbit
Shooting

STEEL ARMY TANK AERIAL RODS. WILL MAKE IDEAL RADIO AERIALS FOR CAR OR TRUCKS

Too long for postage. Advise nearest railway station.

Base to suit Aerial, 9/6 each.



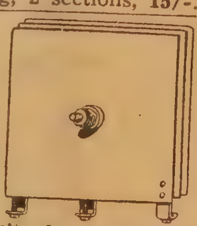
Will also make ideal Fishing Rods

12ft long, 3 sections. Each section 4ft, 22/6. 8ft long, 2 sections, 15/-.

BRAND NEW ENGLISH RECTIFIERS

Make yourself a Battery Charger.

12v. 2 amp.	32/6
6v. 5 amp,	50/-
12v. 5 amp,	79/6
12v. 3 amp,	45/-
6v. 2 amp,	24/6
6v. 4 amp,	45/-



Transformers to suit above Rectifiers, 2 amp, 37/6; 6 volt. 5 amp, 45/-; 12 volt. 5 amp, 55/-.

BRAND NEW LEVER TYPE GREASE GUNS WORTH £4/19/6.

59/6

Ideal for all types of Trucks, Tractors or Cars. 7500 lbs pressure.

45/-
COMPLETE

Professional Magnifier with Stand and Extension Arm. Useful Doctors, Painters, Mechanics, Engineers, Photographers.

ENGLISH ARMY SPOTLIGHTS

IDEAL
FOR
SHOOTING.
FIT ONE
TO YOUR
CAR.

6-volt 37/6 12-volt 25/-
Fitted with Mirror Reflector.

SPRAY YOUR CAR, TOYS, HOBBIES, FURNITURE

Spray FROM YOUR SPARE TYRE
52/6

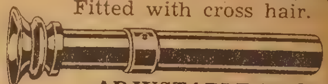
52/6

Spray from you
Spare Tyre

An Ideal Tool f
touching up dar
aged paintwork
Will spray Lacque
Paint, Enamel.

ARMY FOCUSING TELESCOPE

Easily converted for use o
dumpy levels.
Can be used as a rifle sight.
Excellent magnification £4/19/
Fitted with cross hair.

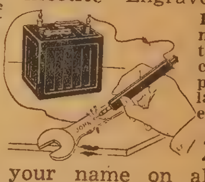


ADJUSTABLE FOCUS

ELECTRIC ENGRAVER

What everybody has been waitin
for. An Electric Engraver tha
works off your car battery.

En- graves any- thing in metal.



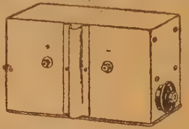
Ideal fo
name
tags, do
collars,
plant
labels,
etc.

29/6

Engrave your name on all you
tools. Marked tools are never stolen
No Garage should be without one

COMPLETE BATTERY CHARGER

Fitted with Brand New English Selenium Rectifier.



Works off 230v. Household supply.

Charges any battery, 6 volts at 4 amps
£6/15/- complete. Also available, 6 o
12 volt Chargers combined. Charge
amps, £7/15/-. Brand new 6 volt,
amp Chargers, complete, £5/2/6.

English Motor and Blower, 24 volts.

Will work off any Lighting Plant.

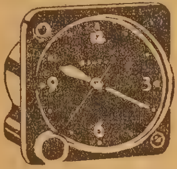
39/6

Larger size also available that will work off 12 or 24 volts £3/15/-.

TORES

lizabeth St., Melbourne, C.1.
Victoria Street. 'Phone FJ5904
Efficiently Despatched
Include State in Address

MERICAN ELGIN 8-DAY AIRCRAFT CLOCKS.

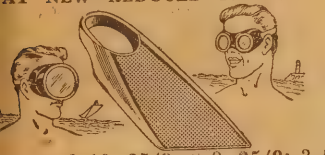


IT
O YOUR
AR OR
RUCK.

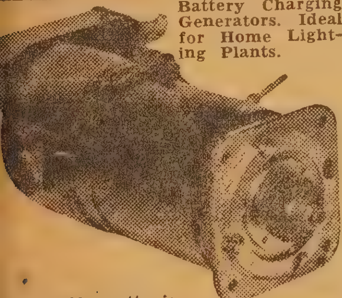
£5/5/-

name of Elgin is world renowned made by the best manufacturer in rica.

UNDERWATER SWIMMING AIDS AS USED BY ARMY FROGMEN AT NEW REDUCED PRICES



s size 8-10, 25/9; 6-8, 25/9; 3-5, 6; 1-3, 22/6. Goggles, 15/6; sks, 6/11; Snorkels, 10/6.



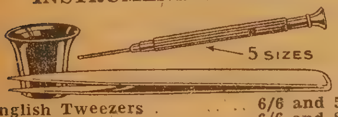
Battery Charging Generators. Ideal for Home Lighting Plants.

-volt, 500 watt, in
od working order £5
volt. 500-watt, new £7/10/-
volt, 1000-watt. Brand new, £12/10/-
) amp welding Generator. Made
America. Brand new £50
sted and in perfect order £35
Be early these won't last long.

MERICAN 'ACUUM or AIR PUMP

uilds up air ressure to lb at 1000 P.M. develops up to 0lb of hyaulic presre; will pump 7½ gallons S.A.E. oil or her liquids per minute. Useful for raying, milking, presses, oil burners, ydraulic systems £3/10/-

WATCHMAKERS AND INSTRUMENT MAKERS



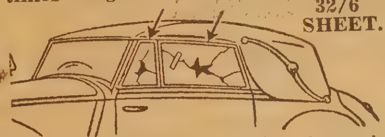
nglish Tweezers . .. .. 6/6 and 5/6
yeglasses .. .. 6/6 and 8/6
xtra strong double lens Eyeglasses, 15/-
CREWDRIVERS, set of 5 .. .. .. 13/9

Stock and Die sets, ½in., ¾in. and 1in. water pipe, £4/19/6.

IN FIRST CLASS ORDER DALTON COMPUTERS IDEAL FOR AERO CLUB. 45/-

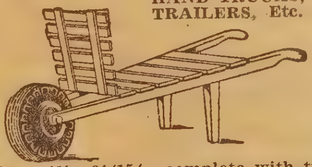
Aircraft Bomb Hoists ideal for garage work. £6/15/-

Replace those broken side curtains with cellulose acetate which takes the place of celluloid and lasts four times longer. Will not discolor. 32/6 SHEET.



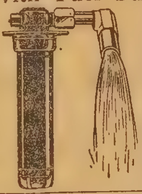
Non-inflammable acetate sheet is recommended for all types of side curtain. Sheets are 20 thousandths of 1 inch thick. Size of sheet, 24in x 52in. Can be sewn or cemented into frames.

Brand new AEROPLANE WHEELS IDEAL FOR WHEELBARROWS, HAND-TRUCKS, TRAILERS, Etc.



10½in x 4½in £4/15/-, complete with tube.

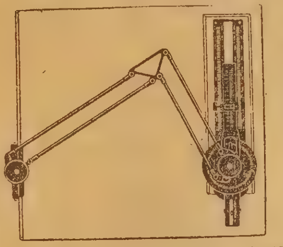
24-VOLT MOTOR COMPLETE With Fuel Pump



Ideal for Caravans. Takes the place of Hand Pumps. £5 each.

Many uses on the Farm. Will transfer Petrol or any Liquid from Drums, etc. Will work from 24 or 32 volts. AC or DC.

R.A.F. PLOTTING BOARD WITH ARM



Bakelite Base. Draws Angles Parallel or Vertical

70/-

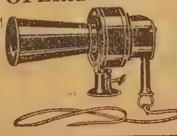
IDEAL FOR ENGINEERS, STUDENTS, ETC.

FOR MOTORIST Special Offer

10/6 Pair

2 genuine American Herbrand spanners, ¾ x 7-8, 1 1-16 x 15-16.

GENUINE AMERICAN KLAXON HAND OPERATED HORNS



Very Loud. Ideal for Factories, Trucks, Boats, etc.

Useful for Time keepers. Brand New. £4/4/-.

R.A.F. LEATHER FLYING HELMETS

35/- each

Intercommunication Tubes 50/- set.

Polaroid Goggles 18/6

MK8 Goggles 48/6 PR. MK7 Goggles 37/6.

WOOL LINED FLYING BOOTS £5/15/- pr.

SPECIAL OFFERS

American Schrader tyre pumps, work from your spark plugs, **39/6.** Fish pond aerators, work from 230 volts, **57/6.** Commando Telescopes, ground lens, **45/-.** Sampson low pressure Spray Guns, **£6/17/6.** Micro amp meters, suitable for making photographic light meters, **17/6.** Aircraft Pressure Gauges, 0 to 20lb pressure, **22/6;** 0-200lb, **25/-.** Pressure type Oil Cans, **15/6.** Aircraft Rev Counters, extra long lead, ideal for boats or cars, **75/-.** All Steel Mechanics' Tool Boxes, lift out tray, **32/6.** Cathode Ray Tubes, complete in case with controls, **55/-.** Pocket Magnifying Glasses, 8 mags, **8/6;** 10 magnifications, **12/6.** Metal Drill Sets, 1-16 to 3-16, 9 Drills for **3/6.** 24 volt motor and hydraulic pump, capacity 3½ gals. per minute, **£3/15/-.** Automatic actuators with 24-volt motor geared with telscopic shaft 400 r.p.m., can be used as fence post borer, etc. **55/-.** Hydraulic pumps, 1200 p.s.i., 8 1-3 gal. per min.; **£18/18/-.** 5 gal. per min., **£7/10/-.** Generator Test Meters, 35-0-35 amp meters, 4¼in dial, **45/-;** 0-10 volt meters, 4¼in dial **45/-.** Loading Resistors can be supplied to make meter read 10.20 at **12/6.** Medical Scalpels, many uses, photographers, etc., **6/6.** Shaded Pole Induction Motors made by Hoover of England, 230 volts, AC. Ideal for Projectors, Tape Recorders, Fans, etc., **£4/19/6.** SAE open end Spanners, 6 to set, **24/6.** Whitworth, 4 to set, **18/6.** 2½in Paint Brushes, set in rubber, special price, **10/6.** Brand new 7-8in Spark Plugs, suit most old type cars, **2/6 ea.** Tappet Transformers, 6, 12, 18 and 24 volts, 3 amps, **39/6,** 230 volts input. Low pressure Spray Guns, **39/6.** Army Steel Tow Ropes with looped ends, **17/6.** Army Tripod for photographic work, levels, etc., 41in long, **22/6** Whitworth Spanner Sets, open one end, ring the other, **25/-.** 6 spanners to set. 230 volt AC Neon Testers, **4/6.**

Army Peak Caps, all sizes, **10/6;** 20 ohm 1½ amp Rheostats, **19/6;** Liquid Shut-off Valves work off 12 or 24 volts ideal for water injectors or petrol shut-off for car theft protection, **55/-;** Brand new American Mae West Life Jackets, **27/6;** Bourke Generators will operate as 6 or 12 volt motors or can be converted to wind chargers, **35/-** Brand New American Oxy Acetylene cutting and Welding Torches, **79/6** for both. New headphones suitable for crystal sets, **17/6** pair.

A Complete RADIO SERVICE

PRICE'S RADIO is the only firm in Sydney that can offer you a complete radio service.

- FULL STOCKS OF BEST BRAND COMPONENTS
- KIT SETS FOR ALL POPULAR DESIGNS
- RADIOS, AMPLIFIERS & ELECTRONIC DEVICES MADE TO ORDER
- REPAIRS TO ALL MAKES OF RADIOS, AMPLIFIERS & ELECTRONIC UNITS
- REPAIRS, ADJUSTMENTS & CALIBRATION TO METERS & TEST EQUIPMENT

Write today for full details and quotation for any work that you may require to be effected.

PRICE'S RADIO

5 & 6 Angel Place, Sydney

"HOT" ATOM

(Continued from Page 1

agriculture. By adding radi phosphorus to superphosphate liser it is possible to trace this phorus through the plant and t mate how much was taken up plant to fulfil the required gr condition. Thus the amount of liser actually needed for the question can be calculated. also be observed whether the chooses the natural phosphor the soil or that of the fertilise thus whether fertiliser is ac needed at all.

The investigation of the act "trace elements" such as cob soil and in diseases of animal led to important results in dete ing the amount needed to rejuv depleted soil.

The distribution of ingredien the substance of compounded rials can be "seen" by adding active isotopes of the material not properly mixed, the counte show great variation throughou material.

Many pages could be written uses of these isotopes but spac about run out. Enough has been to show that the discovery o release of atomic energy is one will bring benefits of great val mankind and that its use fo manufacture of bombs may b garded eventually as a mere product. Nowadays, ordinary plosives are used more for pea purposes and the advancemen man than for the making of wea of war.

A & R . . . . . .QUALITY TRANSFORMERS & CHOKE

A & R's MAIL ORDER SERVICE GIVES PROMPT ATTENTION TO COUNTRY AND INTERSTATE ORDERS! MELBOURNE CLIENTS CAN BUY DIRECT FROM OUR SHOWROOM! THE TRANSFORMERS LISTED BELOW ARE AVAILABLE FOR IMMEDIATE DELIVERY.

* Response Includes Correction due to Negative Feedback ** For Use With Rola 12-OX Speaker.

TYPE AND MOUNTING	IMPEDANCE — OHMS		FREQ. RESPONSE		RATING WATTS	TYPICAL APPLICATION	PRI
	PRIMARY	SECONDARY	DB+—	CPS			
894-23	500	2, 3.7, 8, 12.5	2	50-10,000	5	LINE TO VOICE COIL	16/
900-22	2500, 5000	2, 3.7, 8, 12.5, 15	1	*40-15,000	15	SINGLE 807, EL34 ETC, TO VC	57/
896-9	8000 10,000	2, 3.7, 8, 12.5, 15	1	30-15,000	15	PP 6V6G's A OR ABI TO VC	62/
897-9	8000 10,000	100, 125, 166, 250, 500	1	30-15,000	15	PP 6V6G's A OR ABI TO LINE	62/
763-9	3000, 5000	2, 3.7, 8, 12.5, 15	1	40-20,000	15	PP 2A3's A OR ABI TO VC	62/
809-26	500	2, 3.7, 8, 12.5, 15	1	50-20,000	15	LINE TO VOICE COIL	42/
870-26	10,000	2 or 8	1	*20-20,000	6**	PP 6V6G's OR 807's AS TRIODES	57/
871-9	10,000	2 or 8	1	*20-20,000	12	PP 6V6G's OR 807's AS TRIODES	81/
872-9	10,000	3.7 or 15	1	*20-20,000	12	PP 6V6G's OR 807's AS TRIODES	81/
891-22	6600	83, 100, 125, 166, 250, 500	1	50-12,000	35	PP 807's ABI TO LINE	82/
892-22	3200	50, 62, 83, 125, 250, 500	1	50-12,000	55	PP 807's AB2 TO LINE	97/-

DRIVER TRANSFORMERS

545-9	SE 4000 TO PP AB2 GRIDS 1.6:1. PRIM. TO ½ SEC RATIO 50-10,000 CPS 5 WATTS	57/
588-6	SE OR PP 5000 TO PP 807's CLASS B. 200-5000 CPS 5 WATTS	52/

MODULATION TRANSFORMERS

Primary: 3,800, 5,000, 6,600, 8,500, 10,000 ohms. Secondary: 4,000, 5,000, 6,000, 8,000, 10,000 ohms 150 mA. D.C. per side on Primary. 150 mA D.C. Maximum Secondary Current Ceramic insulators. Freq. Response: 200-7,000 c.p.s. 75 Watts Rating £9/10/-

★ NOTE: 16-2/3rd per cent SALES TAX TO BE ADDED TO ABOVE PRICES

For the Transformers You Need, Call, Write or Telephone to:—

A & R ELECTRONIC EQUIPMENT COMPANY PTY. LTD

HEAD OFFICE, FACTORY AND SALES
TELEGRAMS: "ARLEC," MELBOURNE

378 ST. KILDA ROAD, MELBOURNE, VIC
(OPPOSITE THE SHRINE) TELEPHONE: MX1150.

HERE'S YOUR ANSWER TOM!

(Continued from Page 41)

you will get only 3.75 volts. n easily check that you have rrected connection with the an ordinary torch globe.

e 2.5 volt winding does not centre tap, 7.5 volts would be ed by connecting it in series ie 5 volt winding. This prob- ould not burn the valves out, is a bit on the high side and ping resistor is indicated.

value of the resistor may be ited with the aid of Ohm's Law. oltage drop in this case is 1.2 The total current can be work- t by adding the separate cur- of all the valves. For the sake example, we will take the current as 3.5 amps. The re- ce can be found by dividing voltage appearing across the ing resistor by the current. In ase a 0.35 ohm resistor would ar enough to the mark.

ING A RESISTOR

nay not be easy to go along to p and buy a 0.35 ohm resistor. asier way may be to make the or yourself. For example, the used for electric jug elements rs easily and is able to carry a amount of current.

nnect a voltmeter across the ents and gradually decrease the h of resistance wire in circuit 6.3 volts is applied to the valves. e length of wire overheats, con- two lengths of wire, each ap- imately twice the length of the in parallel.

much for the filament circuit. are not perfectly sure what you by 150 volts high tension. If mean 150 volts AC, either side e centre tap, it would probably matter of rewinding the trans- er, which would most likely be actical.

any event, you probably want d up with about 150 volts smooth for the high tension supply. To this, you will need a rectifier e, a dropping resistor and a filter ork.

your case, there is no separate ding for the rectifier, and it is essary to use an indirectly-heated ifier with sufficient insulation ween the filament and cathode to stand safely the high tension age.

ICAL RECTIFIERS

wo such rectifiers in common use the 6X5-GT and its miniature ivalent, the 6X4. The two 285 leads from the transformer are nected one to each of the plates the rectifier. The centre tap is nected to earth. A switch can connected in this lead if it is ired to remove the high tension ile leaving the filaments operat-

ulsating direct current appears at filament and must be filtered be- e being passed on to the high sion line of the receiver. The usual y of doing this is to wire a choke series with the lead and connect apacitor, one from either end of choke to earth.

The values of the chokes and acitors depend on the frequency the power mains and the degree filtering required. About 10 henries is the usual inductance of the choke and 8 mfd the capacitance of the electrolytics when the filter circuit is used in conjunction with the usual 50 cps power mains.

In your case, a resistor would be required to drop the high tension voltage to the required figure. As with the filament circuit, it is necessary to know the current drain before the value of the resistor can be calculated.

However, it isn't as simple as in the case of the filament circuit because there is a voltage drop across the rectifier. To find out the voltage drop across the rectifier it is necessary to consult a set of valve curves.

The vertical axis of the graph will usually be calibrated in volts and refer to the voltage appearing at the cathode of the valve, while the horizontal axis represents the current drain.

On the graph are a number of curved lines, each one representing a particular transformer voltage. If the voltage of your particular transformer is in between two curves it is very easy to pencil in the curve you require because they are all the same general shape.

You then run up the line representing the current drain until it touches the transformer voltage line. If you then move across horizontally you can read off the voltage appearing at the rectifier cathode.

From then on you can use a simple Ohms Law calculation to arrive at the value of the dropping resistor to be inserted in series with the high tension line. If the filter choke has appreciable resistance, this should be deducted from the calculated value.

POWER CALCULATION

An important point to watch is that the resistor is able to dissipate the power involved without overheating. The power can be calculated by multiplying the voltage drop across the resistor by the current (expressed in amps).

The value will be so many watts and the dropping resistor you use should be able to dissipate at least this amount. With most of our circuits we underestimate the manufacturers rating and use a resistor able to dissipate about twice the power actually involved. Where possible, this is always a good policy.

WE CANNOT IGNORE COLOR TV

(Continued from Page 7)

Hollywood's usual overhead. They would need fewer rehearsals and fewer highly paid dramatic artists.

And for color work, the tracks would be separate and accessible, with none of the losses and complications of the photographic process.

SIMPLE PROCESS

To take copies of the finished tape would involve nothing more than loading it into a multi-channel machine.

How could the film companies match such a simplified system with their enormous overhead costs?

For a start, they would have to adopt electronic photography for TV shows from the day the RCA equipment hit the market, and that would be revolution number one.

Revolution number two, involving electronic photography for theatre release films was less certain. To be sure, it would provide instantaneous monitoring by running electronic and optical cameras in parallel — and that would be a big help with overhead.

But all-electronic release prints would be another story. For the wide screens and 3D, theatres need better definition than their current 35mm prints can give. That is a worry that tape almost certainly cannot solve — for the time being, at least.

But Hollywood's exhibition problems are really another story. As far as television is concerned, the significant points are these.—

(1) American research has just about resolved the problem of compatible color TV, and other countries can have it for the taking as an optional facility.

(2) Visual tape recording is rapidly approaching the commercial stage and will cut recording and distribution costs to a few per cent of present figures.

(3) The new techniques will precipitate a revolution in film studios and slash the fantastic overhead which feature films now carry, whether for TV or theatre release.

(4) Australia can't help but benefit by these developments to the point where a monochrome service will be simplified and color brought right into the realms of possibility.

New Wide-Range Pickup

(Continued from Page 23)

down to the lowest frequency permitted by tone or resonance.

Output at 1000 cps is 0.6 volt as measured on the RCA 12-5-49 V frequency test record. This record represents the normal reference level for microgroove recording.

Distortion tests, using the Cook "N-A Beam" test record indicate inter-modulation well below 2 pc throughout the entire recorded range.

Extensive "A-B" listening tests have corroborated all laboratory data and demonstrated the improved performance of the Model 84 Ultra Linear ceramic cartridge.

Printed and published by Associated Newspapers Ltd., at the registered office of the company, 60-70 Elizabeth Street, Sydney, NSW.

PRICE CORRECTION

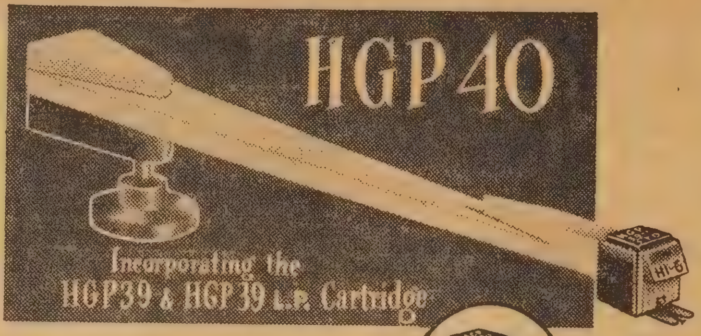
In the February issue of Radio and Hobbies in the Ironcore Transformers half page advertisement a typographical error was made.

The price of the Ironcore Royal Visit Safety Fairy Lights was advertised as 47/6.

This price should have been 97/6.

We much regret the inconvenience caused to many inquirers.

A New Superb ACOS CRYSTAL PICK-UP



IT'S TOPS!
IT'S NEW!
IT'S HERE!

The outstanding features of this pick-u are:—

High compliance, low element mass.

Completely hermetically sealed cryst unit.

High output.

Low stylus pressure, with the minimu of record wear.

Interchangeable pick-up heads wit replaceable sapphire styli.

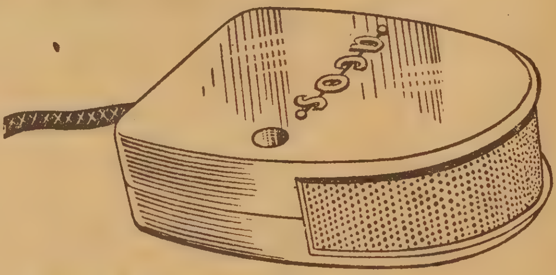
The HGP 39 cartridges will also fit the GP 20 arm.

HGP40 Pick Up	**£9/15/-**
HGP39 Std. Cartridge ..	**£3/12/6**
HGP39LP Cartridge	**£3/12/6**

SPECIFICATION

Response	**flat from 40 cps to 13 Kcs.**
Overall response	**20cps to 17 Kcs.**
Output	**1 volt on standard records, 1/3 volt on microgroove records**
Tracking Weight	**8 grammes**

Australian Agents: AMPLiON (A'sia) PTY. LTD., Sydney, N.S.W.



A NEW SENSATIONAL CRYSTAL MICROPHONE!

ACOS MIC 35 (HAND AND/OR DESK TYPE)

AT THE AMAZING PRICE OF

£2'15'0

A general purpose microphone with high sensitivity and substantially flat characteristic. Housed in attractive Die Cast Case of very robust construction is particularly suitable for use in recording apparatus — Public Address Equipment — Dance Bands — and similar applications.

Provided with built-in shunt resistance of 2 megohm giving response substantially flat from 50/5,000 cps. Resistance of the input circuit will reduce the low frequency response. A grid leak of ½ megohm will reduce the output at 500 cps by 3 dbs and pro rata at lower frequencies.

Approximate capacitance of the microphone is 750pF and cable capacitance will reduce output proportionately.

Frequency response	Substantially flat from 50/5,000 cps.
Output level	= 55 db ref. 1 volt/dyne/cm2.
Load resistance	2 megohms included.
Cable	This microphone is supplied with approximately 4ft. (1.2 metres of co-axial cable (type Unirad 32).
Weight	Microphone only — 6oz. (approx. 170 grammes) complete with packing 7oz. (approx. 198 grammes).
Dimensions	Microphone only 2 7/8in x 2 1/8in x 7/8in plus cable. Complete with packing 3 3/8in x 2½in x 2¼in.

Australian Agents: AMPLION (A'sia) PTY. LTD. Sydney, N.S.W.

AN ORNAMENTAL GARDEN GATE

omestic garden can be made more attractive by the use of ornatal fences, gates and seats. This article describes the construcof an attractive gate which can lead, for example, from a lawn into the usually less attractive vegetable area.

the uprights two 9ft lengths 4in square timber will be re- , sawn at the top to an angle degrees on each side, with a slot cut to a depth of 4½in eive the ridge-board, A (fig. ich is 1in thick.

uprights are also recessed, as to take the cross-members C, are also recessed to make halvnts with the uprights. The members, which can be cut 4in by 3in wood, are 3ft long, e slightly tapered toward their ends, as shown in figs. 2 and 3.

joints should be secured with ised screws.

distance between the two upwill depend on the width of arden path, and assuming that 3ft wide, the ridgeboard will be 4ft 2in long, allowing a 3in overhang for the roof.

Dig the holes for the uprights 1ft 6in deep, and after placing the posts in position nail across temporarily one or two bracing strips of thin wood, so that the uprights remain parallel while the ridgeboard is screwed in place.

The posts can then be bedded in the ground with concrete.

Two 3in triangular members, D, the same length as the ridgeboard, are screwed to the crosspieces, C, for supporting the roof rafters, E, for which 3in by 1in battens can be used.

There are three rafters on each side—one across the middle of the framework, and one at each end. The bargeboards, F, which cover the end rafters, can be cut from wood ¾in thick and 4in wide, the top ends being sawn at an angle of 45 degrees, and the lower ends shaped as shown in fig. 2.

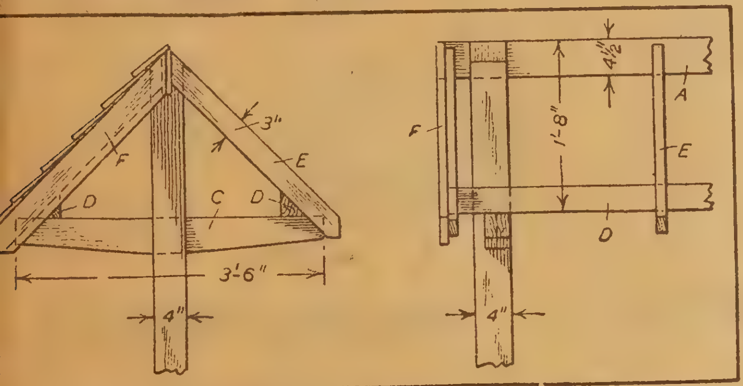


Figure 2: An end view and a part side view of the roof partition.

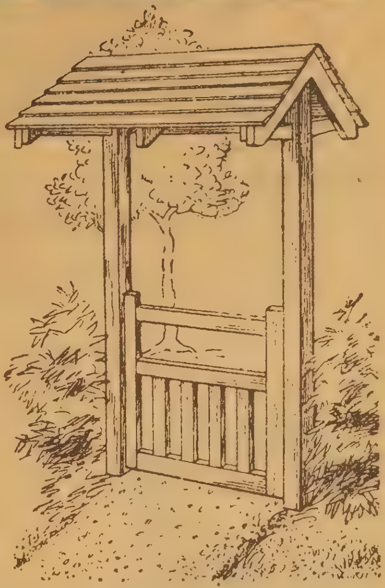


Figure 1: How your finished gate will look. It can be varnished, oiled or painted, according to your taste.

As shown in figs. 1 and 2, the roof is intended to be made up of weatherboards, and these are cut to a length of 4ft 6in, which will provide for an overhang of about 1in at each end of the roof.

Planed battens 3in by 1½in can be used for the main framework of the gate, and for the short uprights 2in by 1½in wood will be suitable. It will be noticed, with reference to fig. 1, that only four short uprights are shown in the gate, and five uprights are indicated in fig. 4.

The actual number can be left to the maker's discretion. Whatever number is used it is important to space them at equal distances apart.

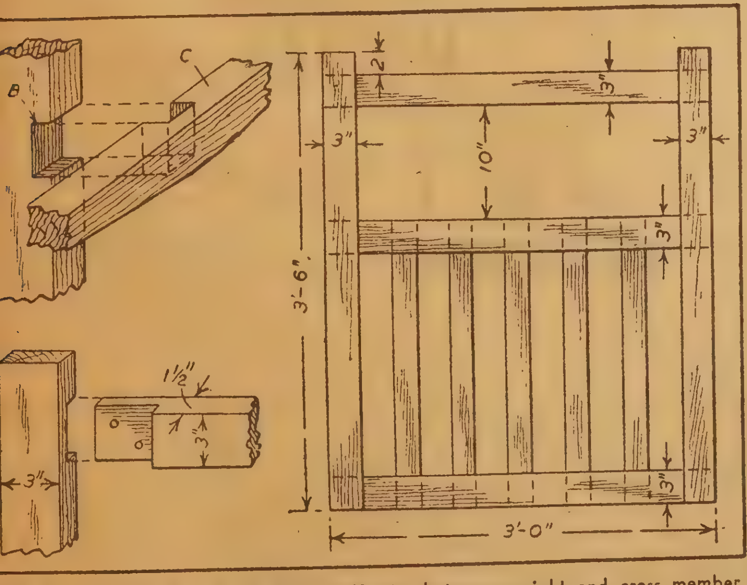
JOINTS

After cutting the wood to the required lengths the ends of the three horizontal members can be sawn, as in fig. 5, and the uprights recessed to form halved joints. The centre and bottom horizontal members are also recessed to take the halved ends of the uprights.

Screw the parts together after giving a coat of paint to all the joints, and well countersink all screw holes, which should be plugged with plastic wood after the screws are driven in.

Two hinges of the cross-garnet type can be used, screwed to the back of the gate, one level with the top horizontal rail, the other level with the lower rail.

With regard to painting, one method is to treat the whole structure with a good wood preservative. An alternative method is to coat all the woodwork, with the exception of the roof with a good outdoor varnish. The roof can be painted a terra-cotta or a tile color.



gure 3: (top left) is a detail of the half joint between upright and cross member. gure 4 (right) gives main dimensions of the gate, while figure 5 (left) shows the half-joint at the end of the horizontal member.

Amplification
Communication
Electronics

A C E RADIO

PHONE
LA 3845

136 VICTORIA R'D. MARRICKVILLE, SYDNEY, N·S·

EVENINGS & WEEKENDS: "KALUA," COLLAROY ST., COLLAROY — XW5
DULWICH HILL, UNDERCLIFFE, EARLWOOD, TRAM AT DOOR, STOP No. 42.

Brand NEW AR8-AT5 Equipme

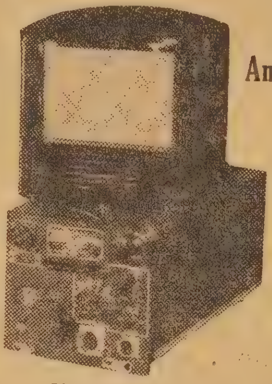
in Original Factory Tropic Proofed Cases

The Receiver, Transmitter, Aerial Coupler & Shock Mounts and Circuits

£57/10/

Will Separate Receiver, £32/10/-; Transmitter, £25; A.C.U., £3.

Packing FREE! for Air or Passenger Rail. Goods Rail add 10/-.



A.R.B.

American Communications RECEIVERS

195KC to 9.025MEG
Complete with Valves.

£19/10/-

Converted, Air-tested. Complete with Power Supply and Speaker.

240V AC £29/17/6
24V DC £27/17/6
12V DC £32/17/6
32V DC £28/17/6
6V DC £37/10/-

BRAND NEW A.R.B. RECEIVERS, £22/10/-.

MARCONI 1155

Communications receivers

200K.c. to 17.5megs

10 VALVE. 5 BAN
DUAL RATIO DIAL
CALIBRATED
FOR ALL BANDS.

£23/17/

ATR 2B. TRANSCEIVERS

Crystal controlled. 20 Watt output. 3 to 7 meg. All standard Valves. Complete with crystal. Airtested. 12V. operation. Will convert to other frequencies if required at slight extra cost.

£47/10/0

Heavy Duty Transformers

1750 x 1750, 750MA	10-10-0
500 x 500, 500MA	4-10-0
500 x 500, 340MA	3-15-0
265 x 265, 250MA	2- 5-0
365 x 365, 150MA	2- 5-0
400MA Chokes	2-10-0
150MA "	1- 2-6
650MA "	3-10-0

American Variable Transmitting Condensers

Suitable for TO 1200V.

100 P.F.	£1/1/-
60 P.F. with 50 to 1 Vernier Dial	£1
30 P.F.	10/-

CERAMIC FORMERS

Ribbed 2in Diameter. With mounts 6in long — 5/-

100 watt AERIAL RELAYS

Aerial changeover relays in metal case (24v). 18/6
A.W.A. 12v. Plastic Case £1

LIFE BOAT TRANSMITTERS

144 Meg., 1 Valve TX with Circuit £1/5/-
POST 2/6

WANTED

Transmitters, Receivers, Transceivers, Test Gear, Public Address Equipment. Top Prices, or will Trade-in or Exchange. State condition and price to above address.

NEW

VIBRATORS

6V. A.W.A. GAS FILLE
Synchronous, Heavy Duty
15/-

SIGNAL GENERATORS PHILIPS TAIOIC

Operates from 6V or 240V A.C
390KC to 23MEGS.
AIR TESTED
PERFECT
ORDER **£32/10/-**

A.C.E.
Amplification
Communication
Electronics

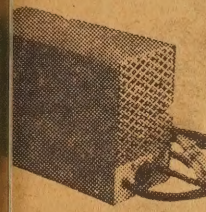
RADIO

PHONE:
LA 3845

136 VICTORIA R'D. MARRICKVILLE, SYDNEY, N.S.W.

NINGS & WEEKENDS: 'KALUA," COLLAROY ST., COLLAROY — XW5956
WICH HILL, UNDERCLIFFE, EARLWOOD, TRAM AT DOOR. STOP NO. 42

VIBRATOR POWER SUPPLIES



6 VOLT INPUT, 300 VOLT 100 M.A. OUT. -- -- -- -- --	£9 17 6
12 VOLT INPUT, 325 VOLT 125 M.A. OUT. -- -- -- --	£12 17 6
6 Volt. Bat. or 240 A.C. In., 300 Volt M.A. Out. --	£11 19 6
12 Volt Bat. or 240 A.C. In., 325 Volt 125 M.A. Out. --	£14 19 6

FULLY FILTERED. HASH FREE. FULLY GUARANTEED. SUITABLE FOR P.A. OR TRANSMITTERS OR HOME USE.

BATTERY TO A.C. INVERTORS

6V or 12V input to operate electric razors .... ---- ---- .... ----	£4/17/6
6V or 12V to 240AC to operate mantel radios for cars and caravans .... ---- ---- ---- ---- ---- ---- ---- ---- .... ---- ----	£7/17/6
, 12V, 24V or 32V to 240V A.C.50 cycle, to operate P.A. equipment, diograms. Ratings, 100 Watts.	£15-17-6

Equipment for Operation off other Voltages Made to Order. Get Our Quote.

CHANCERY 33 r.p.m. ADAPTORS £3'17'6

t any electric or clockwork motor. Includes Decca Microgroove pickup.

B.S.R. 3-SPEED MOTOR & TURNTABLE

SPECIALLY SUITABLE FOR TAPE RECORDERS.
4-pole motor; lever speed control, 33, 45, 78 rpm.

£3/17/6

NEW LATEST MODEL

COLLARO

521
3-SPEED CHANGERS
78, 45, 33
WITH TWIN CRYSTAL HEADS

£15-15-0

BENDIX

C221. FREQUENCY METERS. AIR TESTED.
Original Crystal and Calibration Book

£45/0/0

NEW B.S.R. TYPE G.U.4. 3-SPEED PLAYER UNITS. TURN-OVER CRYSTAL P.U. FOR 33, 45, 78, RECORDS

£9/17/6

A.R.7 COMMUNICATIONS RECEIVERS

ade under licence of American National H.R.O., the A.R.7 is the finest achievement in communication field used by Aus-
alian Services. It is standard equipment with all leading airlines. 9-valve 240 A.C. operation features signal strength
eter, crystal gate, 2 R.F. stages, 2 I.F. stages, noise limiter. 5 band, 140 K.C. to 25 MEGS.

AIR TESTED £47/10/-

NEW A.R.R.2 RECEIVERS

V.H.F. receiver, 230 to 258 Megs, and 6 channels on
oadcast band. Ideal conversion to carset and for hams.
ready-made, double-conversion V.H.F. receiver. 10 mini-
ure valves, smaller than average
rset.
cluding photostat of circuit.
RICE £11/17/6

NEW

AMERICAN INDICATOR UNITS

11 valves, 3 B.P.I., C.R.O. Ideal for oscilloscope or pan-adaptor. In original cases withall plugs, cables, etc.
PRICE £11/17/6

ANSWERS TO CORRESPONDENT

A.W. (Sunshine, Vic.) has some valves on hand which he would like to use in the audio test oscillator which was described in the August issue of last year.

A. We do not hold out much hope. The amplification factor of the 6J7 type tubes when connected as triodes in the normal way is about 20. The amplification factor of the 6SL7-GT on the other hand is 70. The amplification factor of the 6J7 as a triode could be increased by connecting the screen grid to the control grid. However, with this connection little plate current would flow with reasonable values of plate voltage and grid bias. We are not keen on the idea of using a diode-connected 6N7 in place of the 6X5-GT as a rectifier. It would probably work but the heater/cathode insulation of the 6N7 is designed to withstand a relatively small potential difference and with the secondary of the transformer an effective 300 volts RMS, a breakdown is likely. Types 6D6, 6SK7, &c., may be triode connected if desired. In such cases they retain the variable-mu characteristic of the pentode.

J.S.McC. (Kingaroy, Qld.) is very interested in constructing small radio sets but is puzzled because he cannot properly read the schematic symbols.

A. Your problem is not a new one and there is no magic way to complete familiarity with circuit diagrams. We can supply through the 2/- Query Service a page of circuit symbols which may assist you but beyond that it is simply a matter of studying articles and diagrams until the language becomes a little more familiar. We tip that, by the time you have constructed one or two small sets, the difficulty will largely have disappeared.

R.L.K. (Mungungo, Qld.) suggests that we should describe a receiver with special attention to the RF section and only a minimum of audio equipment.

A. Many thanks for your letter and for the suggestion, which appeals to us as a very good one. We may do something about it in the very near future.

J.G.K. (Neerim South, Vic.) sends along an advertisement and says he would like to be able to build for himself a Geiger Counter.

A. We have had several requests for the description of a Geiger Counter and may tackle the design as soon as time permits. Your advertisement has duly been attended to and the data sheets sent through the post. Many thanks for your comments on the magazine, but we won't undertake to answer in these columns your query about the expanding Universe.

H.W.P. (Bymount, Qld.) wants to do some experiments in receiving radio signals emanating from the sun and asks us for advice about frequency, &c.

A. You give no hint as to the reason for your proposed experiments but we doubt whether you appreciate just what is involved. In the normal way, specialised directional aerials are required, plus equally specialised receivers capable of scanning the whole high frequency spectrum above about the 30mc. If you are really serious in this matter your best plan would be to get in touch with the CSIRO in Sydney whose Radio Division has done a lot of work investigating signals from space.

R.W. (Warrawee, NSW) is puzzled by the switching in our tape recorders which makes it appear that the erase head is working at all times.

A. The erase head may actually be in circuit but it is only fed with RF energy when the recorder is switched to "record". You will note that there is a switch section either in the cathode or B-plus circuit of the oscillator valve which renders it inoperative for "playback". The permanent connection between playback and erase heads is not likely to be significant unless the coupling condenser is made substantially larger than the 250pf. value specified.

R.H. (Guildford, NSW) is studying for his amateur licence and soon hopes to be operating a 10-watt transmitter. He wonders how he can satisfy the requirement governing the instruments used to measure the power of the transmitter. He also asks about power transformer ratings for the "New Fireside Five" and the "Superhet Four".

A. In the case of amateur transmitters the power mentioned in the regulations is the DC input to the plate of the final stage. This can be measured with ordinary DC milliammeters and voltmeters. They could be built into the transmitter or it would be permissible to make the measurements with an ordinary service multimeter. Some form of indicating instrument will be required in a for tuning purposes. If the de your transmitter is such that i ously cannot exceed the maximu mitted input you have nothing t about. Due to the poor regula the power transformer and the the filter choke, the high ten the "Superhet Four" is only ab volts. At this voltage the curren is within the 50 mA rating of the former. The high tension voltage "New Fireside Five" on the othe is higher.

E.W. (Sydney, NSW) wants t a simple valve tester and wants t whether we have ever publishe such constructional details.

A. The only article we have these lines, E.W., is a "Reader It" article published in the Ja 1951, issue. This is available t our query service for the usual 2/-.

J.D.C. (Cootamundra, NSW) se story for the Serviceman Who concerning the troubles of a c serviceman, particularly with rega car radios.

A. Thanks for your story, J.D.C we will pass the letter on to the viceman. Your story certainly h interesting slant and emphasises th which must be exercised in adj modern car electrical systems.

D.J.H. (Nullawarre, Vic.) writes t that a recent suggestion of ours r ing a faulty set proved to be c and that the set is now functioning rectly.

A. Many thanks for your letter, I and we are very glad to learn tha diagnosis was correct and that th is now performing correctly. We wish all readers' problems were as as that.

K.E.H.W. (Mt. Glorious, Qld.) to know if there is a publication ing details of the national and com cial programs, their frequency, general information of a similar na

A. We think you will find that ABC Weekly will supply all this formation and suggest that you co the head office of the Australian B casting Commission in your ne capital city for further details. A natively, your local newsagent ma able to supply.

D.W.F. (Westmead, NSW) wishes build the heavy duty battery cha which was described in the Noven 1950, issue of Radio and Hobbies, wonders if the parts are still avail

A. Yes, D.W.F. The battery cha is still our standard large design parts are available through the u radio supply houses. If you have been in the habit of dealing with particular one, it would be a good to look through the advertisements this issue.

W.R.F. (Mosman, NSW) sends u contribution for the Serviceman cerning a set which he recently viced.

A. Many thanks for your contribut W.R.F., and we have passed the le on to the Serviceman for his poss use at a later date. The problem quite an interesting one, and, as say, could prove quite a teaser u the faulty IF stage was located.

F.H.O. (Glenroy, Vic.) inquires a the range of the 288 Mc transmi described in the March, 1950, issue Radio and Hobbies, and also whet he would require a licence to operate

A. The range of transmissions on frequency is generally confined to of sight conditions except for very c working. You will most certainly n a licence to operate this or any ot transmitter. The penalties for s breaches can be very severe. Furt details of such licence can be obtai from the Wireless Branch of the PM Department in your nearest capital c For a quote covering the cost of parts, we suggest you contact one our advertisers from Melbourne.

THE "RADIO & HOBBIES" QUERY SERVICE

ALL queries concerning "R & H," designs, to which a POSTAL REPLY is required must be accompanied by a postal note or stamps to the value of TWO SHILLINGS.

For the same fee, we will give advice by mail on radio matters, provided the information can be drawn from general knowledge. UNDER NO CIRCUMSTANCES, however, can we undertake to answer problems involving special research, modification to commercial equipment or the preparation of special circuits.

Whatever the subject matter, we must work on the principle that a letter is too involved if the reply takes more than 10 minutes of our time.

Queries not accompanied by the necessary fee will be answered FREE in the columns of the magazine and presented in such a way as to be of interest to others readers.

To those requiring only circuit reprints, &c., we will supply for TWO SHILLINGS diagrams and parts lists from our files covering up to three "R & H" constructional projects. Scale blueprints showing the position of all holes and cutouts in standard chassis will now be 4/6. These are available for nearly all our designs but please note they do NOT show wiring details.

Address your letters to The Technical Editor, "RADIO and HOBBIES," Box 2728C, GPO, Sydney.

Note that "RADIO & HOBBIES" does not deal in radio components. Price quotations and details of merchandise must be obtained direct from our advertisers.

onic Flash Unit

inued from Page 77)

with a modified lead in f a short length of flexible ire.

case it will probably be to join the wires from the he tube at the rear of the block before it is fitted , protecting the joint with of plastic sleeving.

ls for the neon lamp should ng enough to pass through grommet with a couple of pare. They are then solder- leads from the neon, the red with insulating sleev- the neon pushed into the There is no objection to the ches of wire being tucked pace in the top of the gun.

rm of assembly is not quite ient as that which uses a n with a removable lid, but ake possible a much smaller which is in keeping with the e unit. For this reason the ent appears to be quite jus-

e are several methods of clos- bottom of the gun, but the hich appeals to us most is that oden plug about ½in thick and to fit neatly inside the tubing. be held in place with two or mall countersunk wood screws.

bracket for attachment to the could also be fastened to this n which case the hole for the should be offset toward the Alternatively, the bracket may the form of a right angle with g fastened to the side of the ue to the small size and light of the gun it need only extend e side a short distance. This void any chance of the mount- rews fouling the larger com- ts at the top of the gun assem-

S FROM GUN

o pairs of leads will come from un, one running to the power y and the other to the shutter cts on the camera. In the case of atter pair make sure that they orrectly polarised, the lead from rame of the gun going to the of the camera.

e shoulder strap was made from ther belt purchased from a chain for a few shillings. We selected one obviously designed for a very corpulent gentleman (about 43in) and this length worked out very nicely.

Attachment is by means of two countersunk screws, with heads inside the case, with a washer and nut on the outside to hold the strap. The screw should be cut off close to the nut, filed flush, and then a neat blob of solder flowed on to the nut. This will prevent the strap coming adrift and is quite neat in appearance.

To use the unit it is only necessary to switch it on, selecting the power rating required; As soon as the neon flashes a picture may be taken but if it is not desired to fire the flash immediately the switch should be left in the "on" position, the standing current being only about 1.5 mA.

CHARGE AGAIN

As soon as a flash is fired the capacitors commence to charge again automatically and the photographer may give all his attention to changing film and preparing for the next shot. Charging time for 80 joules should be about 10 to 12 seconds and, in most cases, a new flash will be ready as soon as, or sooner than, the photographer.

Since the final proof of the pudding is in the eating we finished off our work by making a number of test exposures and processing them under various conditions.

Two lots of six exposures were made, each at the same distance, but varying from f5.6 to f32. One series were processed in microdol and the other in D76. By pouring only half the required quantity of developer into the tank, followed by the remainder at a calculated time later, it was possible to produce two development times on the one film.

The effect of the extra development did not appear to be very pronounced, though it was more noticeable in the case of the microdol.

From these experiments we would say that the effective light from the 80 joules of energy is at least equal to that of 100 joules from the high speed flash and we suggest the following guide numbers:

SUPER XX in microdol (50 pc over development)	80
Super XX in D76 (normal development)	120

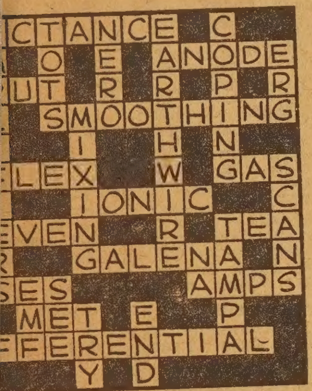
Before next month's issue we hope to be able to conduct some experiments on other types of films, and to publish the results.

FOCAL POSITION

Another important point is the placing of the tube with relation to the reflector, the ideal arrangement giving a spread of light of about 50 degrees, the normal coverage of a standard lens. There is some evidence that we have not achieved this ideal with the reflector we used and that the tube is too close to the focal point, producing a narrower beam than is desirable and not covering the entire picture.

Time has prevented us from completing our experiments and this must also be held over until next month. However, it would appear that the present distance from the apex of the reflector, about 1¼in, is too short, and will have to be increased, possibly to something like 1¾in.

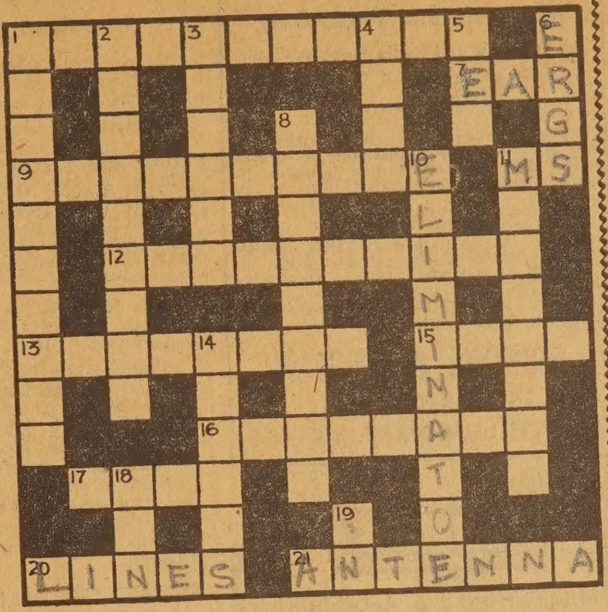
t month's solution



THE R & H RADIO CROSSWORD No. 2

ACROSS

1. Early type detector.
7. ~~Organ of hearing.~~
9. TV camera tube.
11. ~~Manuscript (abbrev.).~~
12. Does not acquire electrical charge.
13. Electric shock (faint sensation).
15. Shade over CRO tube.
16. Used in transmitting valves.
17. Method of recording TV shows.
20. Carries telephone conversation.
21. Aerial.



DOWN

1. Checked against a standard.
2. Achieved by tuning circuit.
3. A type of frequency changer.
4. Affected by humidity.
5. Megohm (abbrev.).
6. ~~Units of work.~~
8. Precaution against instability.
10. Used with old battery sets.
11. Millionth part of ohm (plural).
14. Indicates alkali or acid.
18. Charged atom.
19. Zero Normal (initials).

Solution and further crossword next month.

INSTRUMENT CASES

Wholesale and Trade Only

All Standard and Radio Hobbies Cabinets obtainable at all leading Radio Distributors.

We specialise in All Classes of Covered Cabinets—Instrument, Portable and Mantel Radio Cabinets in either Leather or Leatherette.

Interstate Representatives: J. H. Williams & Co., 50 William St., Melbourne; B. L. Andrews, 144 Gawler Place, Adelaide, SA; H. M. King & Sons, King George Square, Brisbane, Qld.; Affiliated Agencies, 92A Barrack St., Perth, WA; L. V. McPartlan, 223 Liverpool St., Hobart, Tas

GIBBONS & DENHAM
15 FARIOLA ST.,
NORTH LIDCOMBE. YX1456

AWA
RONETTE
MICROPHONES & ACCESSORIES

Type C53
£5/7/-

Technical pamphlets will be mailed on request. Other types also available from

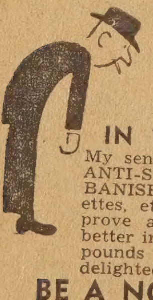
NICHOLSONS LTD.
BARRACK ST., PERTH
and leading wholesalers.

TAPE RECORDISTS

Join ATRA, Australian Tape Recordists Association for Tape Recorder owners and enthusiasts, engineers. Send self addressed stamped envelope to:

Box 27 P.O., Noble Park, Victoria.

Smoking Got You DOWN?



STOP SMOKING
IN 1 DAY OR LESS

My sensational and inexpensive ANTI-SMOKING DISCOVERY BANISHES all craving for cigarettes, etc. Acts like magic. Improve appetite, feel 1000 times better in health. Save money, be pounds in pocket. Thousands delighted; testimonials galore.

BE A NON-SMOKER

by sending name and address AT ONCE for a copy of my helpful FREE BOOKLET entitled "How to Stop Smoking".

WRITE FOR FREE BOOKLET

Send for my FREE BOOKLET and detailed information and Special Application Form. Sent free, without obligation, under plain wrapper. Write today, enclosing name and address, together with 3 stamps for postage.

JACK ELWOOD (Dept. RH 4/4)
BOX 2444 G.P.O., SYDNEY.

STANDARD 5 RCVR

(Continued from Page 64)

except the valve cathodes, during the first 10 minutes would be an indication that something is wrong.

Watch the rectifier valve particularly. Any sign of a red glow from the plates of the valve indicate a low resistance somewhere in the high tension circuit. If so, check the wiring yet again, and if this fails to reveal any errors it will be necessary to start checking components.

The chances of your having this sort of trouble are not great, but we mention it just in case.

You will probably find that you will be able to tune in stations right away simply by rotating the tuning capacitor. A length of wire connected to the aerial terminal may be necessary to get sufficient pick-up and, even so, the stations may not be very loud. The sensitivity will only come up to normal when the various tuned circuits are correctly aligned.

FITTING THE DIAL

You are now in a position to mount the dial. As it comes to you the dial control spindle will be mounted in the centre of the three holes along the bottom of the metal assembly plate, and the first job is to transfer it to the hole on the left.

The drum will be secured at the back of the mounting plate by a screw. This should be removed as its only purpose is to hold the dial together. Mount the drum on the tuning capacitor shaft and at the same time place the bolts holding the mounting plate to the chassis.

It isn't easy to do this without getting the cord tangled up, and you may do better to remove the cord altogether and replace it afterwards. Please yourself about this point. If you do remove the cord, keep a note of how it goes so that you can replace it correctly.

IMPORTANT ADJUSTMENT

Part of the job of fitting the dial cord is to position the pointer so that it is in its correct position with the tuning capacitor plates as far in mesh as they will go. This point is marked on some of the later dials. If not the correct position is on the low frequency side of the 550 Kc mark and about half the distance from the 550 Kc mark as the 600 Kc mark.

The mechanism should be able to rotate the capacitor through the full 180 degrees without straining the cord at the extremes of the range. If you first you can't do this, some revision of the relative positions of the capacitor shaft and drum may be necessary.

The next job is to adjust the various tuned circuits for best efficiency. If you have an oscillator and other test instruments you will know how to do this anyway but for those who have no such facilities, we intend preparing a special article on the alignment of this receiver for publication in next month's issue.

In the meantime you will have plenty to interest you in collecting the parts and getting the set ino operation.

WANTED TO
SELL OR EXCHA

FOR SALE: Test equipmen
condition, including va
tester, oscillator, sig. tracer, F
multi-meters, speaker unit, s
Also high quality P.A. system
Layton, P.O. Box 228, Tamwo

FOR SALE: Radio and Hobbi
Radiotronics 1949-1953. Text
Write **W. Layton, P.O. Box 228**
N.S.W.

FOR SALE: R & H 5in oscillo
built, perfect condition,
Ramsay Rd., Fivedock. UA75

SALE: BSR 3-speed motor-tur
Goldring standard microg
up to suit. £8 **11 O'Briens Rd.,**

SELL: Panoramic Receiver
5in CRT, needs dial and
3.5-30 Mcs, £35. **L. G. Reynold**
Melbourne.

SELL: MN26C radio compass
motor. Brand new £15, or
good multimeter or 3-spee
changer, also assorted valves,
cheap. **Burden, P.O. Box 120,**

FOR SALE: Pure sine wave
bias and erase units, in
fully adjustable, including 2 v
circuit, £8/17/6 post free. **Electro**
tralia Pty. Limited, 41 Enfield St.
Park, Western Australia.

SELL: 68 copies R & H '46-
Separate 1/-. **Alec, WL2943,**

SELL: Almost new: 6v 240, 10w
7 valves, 600 line £12, D104
Bovey, Chelona, Mackay, Q'ld.

SELL: Goodman's axiom 150
speaker in vented box. G
specs, handsome appearance. **198**
Hills Rd., Thornleigh. JW2242.

SELL: Tape recorders:—to cle
demo. models as new, fully
greatly reduced price: Model
meter level indicator £90, Model
£130, A-deck £35, or best offer.
tr, 2 spd, fast fwd. Also var. part
311 Sussex St., Syd. M2159.

WANTED: AR7 Receiver wan
complete, also P.S. trans.
R. J. Glen, 53 Brunswick Rd., East
wick, N10 Melb. Vic.

WANTED: Alnico Permanent
U shaped, size approx. 1 5/8i
all, ½in wide, gap 7/8in, any numb
one up required, state price to "
Castings, 10 Sampson Rd., Kala
W.A.

WANTED: XAO mod. ocs. or
Com. rec. 200 Kc to 20 Mc
order pref. conv. 240 AC. **54 Mee**
Kingsford.

WANTED: Frequency meter or
generator suitable for Ham us
particulars and price to **A. Girling,**
doo, N.S.W.

WANTED: Collection R & H. Pay
Atkins, 52 Butler Av., Moonah

GET EXTRA MONEY

All Modern Moneycrafts ta
quickly by Special Postal Cou
Learn make toys, dolls, slip
gloves, flowers, model hats, lea
and plastic goods, confectionery,
BIG spare time profits. **Dept. B.**
Bon College, Box 279 Haymarket
Sydney.

SONGSTER
REGD
PICK-UP & PHON
NEEDLES